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VENTRAL HERNIAS

A Study of 550 Hernias and 458 Repairs

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Introduction

In January 1938 a study was undertaken of all hernias admitted to the wards of St. Luke's Hospital in the years 1926 to 1935, inclusive, and all hernias repaired from 1916 to 1925, inclusive, which returned for follow-up examination for 9 months or more postoperatively or until a recurrence was discovered. Included in this study were 4,442 hernias. Among these were 550 ventral hernias or 12.4 per cent of the entire group (table 1).

This total was made up of 60 primary epigastric hernias, 8 recurrent epigastric hernias, 168 primary umbilical hernias, 17 recurrent umbilical hernias and 297 incisional hernias (which includes recurrent incisional hernias as they were considered to still be incisional hernias). The percentages for the different types of hernias, including the recurrent hernias in each group were: epigastric, 12.4 per cent; umbilical, 33.6 per cent; and incisional, 54.0 per cent.

Included among the total of 68 epigastric hernias are 3 hernias which were situated below and to the left of the umbilicus. Two were primary and one a recurrence.

Of the 550 ventral hernias 458 were repaired by operation. The recurrence rate among the 346 followed for 9 months or longer was 16.8 per cent.

Etiologic Factors

The average age of the patients when these ventral hernias were first noted was 32.8 years and at the time of admission to the hospital or operation, 36.2 years.

Only 37.1 per cent were found in males, leaving nearly two-thirds, 62.9 per cent, in females. The recurrence incidence, 12.9

From the Surgical Services of St. Luke's Hospital, New York.

per cent, in males was somewhat lower than that in females, 18.5 per cent.

A history of definite trauma as the etiologic factor in the development of these ventral hernias was given in only 9.8 per cent of the case histories. (See foot notes under tables 9, 29 and 46.)

Symptomatology

A history of pain associated with the hernia was given by 55.3 per cent of the patients. The average duration (time from when the hernias were first noted to the time of admission to the hospital or operation) was 4.2 years.

Table 1

Type of Ventral Hernia	Total	Per Cent of All Ventral Hernias	Per Cent of All Hernias Studied	Per Cent Recurrences
Epigastric[1]				
Primary epigastric[2]	60	11.0	1.4	14.0
Epigastric recurrences[3]	8	1.4	0.2	16.7
Totals (epigastric)[1]	68	12.4	1.6	14.3
Umbilical				
Primary umbilical	168	30.5	3.8	12.8
Umbilical recurrences	17	3.0	0.4	28.6
Totals (umbilical)	185	33.6	4.2	15.2
Incisional[4]	297	54.0	6.7	17.8
Totals	550	100.0	12.4	16.8

1. Three hernias through the posterior rectus sheath below and to the right of the umbilicus are included.

2. Two hernias through the posterior rectus sheath below and to the right of the umbilicus are included.

3. One hernia through the posterior rectus sheath below and to the right of the umbilicus is included.

4. This includes recurrences after repairs of incisional hernias as they were considered to still be incisional hernias.

Physical Findings

The hernias classified as small made up 41.8 per cent of the total; medium sized, 28.2 per cent; and large 30.0 per cent. The recurrence rates according to size were, in the same order; 10.4, 19.0 and 22.8 per cent. The operative mortality, also in the same order, was: 0.77, 3.84 and 6.85 per cent.

Over one-third, 35.6 per cent, of these ventral hernias were incarcerated. This is somewhat less than was found to be the case with

femoral hernias, 43.7 per cent. Recurrences developed in 19.1 per cent following repairs of incarcerated hernias. The operative mortality was 4.83 per cent, due entirely to strangulation having developed in previously incarcerated hernias.

Strangulation was present in 5.5 per cent of the ventral hernias. This is only one-third that found with femoral hernias, 17.5 per cent, but three times the figure for inguinal hernias, 1.9 per cent. Recurrences developed in 46.2 per cent of the wounds of the repair of strangulated hernias. This figure was calculated only upon the number of patients who returned to follow-up clinic for periods postoperatively of 9 months or more. The operative mortality was 40.7 per cent in the presence of strangulation.

Results According to Type of Repair

The recurrence rate when these hernias were repaired without fascial sutures was 16.8 per cent and with fascial sutures 15.4 per cent. As with the other types of hernias, a greater proportion of difficult closures were included in the latter group.

Postoperative Complications

Postoperative complications developed following 24.5 per cent of these repairs. This is twice as great a percentage as followed the inguinal repairs, 12.9 per cent, and half again greater than the figure for femoral repairs, 15.9 per cent. Respiratory infections developed following 5.9 per cent of the repairs, circulatory complications following 5.5 per cent and wound infections in 12.2 per cent of the incisions.

Follow-Up Data

Of the 550 ventral hernias studied, 92 were not repaired. Of the 458 hernias repaired, 346 were followed for periods of time of 9 months or longer, the average time being 35.3 months. Among these were discovered 58 recurrences, an incidence of 16.8 per cent. The average time postoperative at which these recurrences were first noted was 22.9 months.

Repair of Ventral Hernias

Suggestions as to repair of ventral hernias will be taken up in detail under each type of ventral hernia.

Part I

EPIGASTRIC HERNIAS

A Study of 68 Hernias and 65 Repairs

These 68 epigastric hernias made up only 1.6 per cent of the entire group of hernias studied and 12.4 per cent of all ventral hernias. (Included were three hernias through the posterior rectus sheath below and to the right of the umbilicus, 2 were primary, 1 recurrent.) Of the 68 hernias, 65 were repaired by operation. A total of 49 were followed for periods of time of 9 months or longer. Seven recurrences were discovered, an incidence of 14.3 per cent.

Table 2

Age at Which Hernia was First Noted

Primary Hernias

Age Group (in Years)	Total Hernias	Per Cent of Entire Group		Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences	
0 to 9	3	5.0	11.7	3	0	0.0	0.0
10 to 19	4	6.7		4	0	0.0	
20 to 29	17	28.3	46.6	14	3	21.4	17.4
30 to 39	11	18.3		9	1	11.1	
40 to 49	11	18.3	35.0	7	2	28.6	16.7
50 to 59	10	16.7		5	0	0.0	
60 to 69	4	6.7	6.7	1	0	0.0	0.0
Totals	60	100.0	100.0	43	6	14.0	14.0

The average age of the patients when these hernias were first noted was 36.6 years.

These hernias were all epigastric except 2 which passed through the posterior rectus sheath below the umbilicus, as noted in the text. This footnote applies to all tables on primary hernias in Part I.

Primary Epigastric Hernias. Of the 68 hernias, 60 had not been previously repaired. Fifty-seven of these were repaired and 43 followed for periods of time of 9 months or longer or until a recurrence was discovered, the average time of follow-up being 33.4 months. Six recurrences were found, an incidence of 14.0 per cent.

Epigastric Recurrences. Only 8 recurrent epigastric hernias were included in the study. All were repaired. The various sets of figures regarding these 8 hernias are given only as a matter of interest as

the number is much too small for them to have any particular significance. There were 2 postoperative deaths. The remaining 6 patients were followed for periods of time of 9 months or longer. One recurrence was discovered, giving a recurrence rate of 16.7 per cent.

ETIOLOGIC FACTORS

Onset

Primary Epigastric Hernias. The incidence in each of the first 2 decades of life were nearly equal, 5.0 and 6.7 per cent. The highest incidence was in the third decade of life, 28.3 per cent. Following this it decreased to the seventh decade.

The average age of the patients when these hernias were first noted was 36.6 years. (See table 2.)

Epigastric Recurrences. The average age of the patients when these hernias were first noted was 47.7 years.

Age at Time of Admission or Operation

Primary Epigastric Hernias. The average age of the patients at the time of admission into the hospital or operation was 40.7 years, giving an average duration of 4.1 years. The age incidence increased to the fourth decade of life, was approximately the same in the fifth and sixth, and decreased in the seventh. There was no

Table 3

Age at Time of Admission or Operation

Primary Hernias

Age Group (in Years)	Total Hernias	Per Cent of Entire Group		Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences	
0 to 9	1	1.7	8.4	1	0	0.0	0.0
10 to 19	4	6.7		4	0	0.0	
20 to 29	10	16.7	40.0	8	1	12.5	14.3
30 to 39	14	23.3		13	2	15.4	
40 to 49	12	20.0	40.0	7	1	14.3	14.3
50 to 59	12	20.0		7	1	14.3	
60 to 69	7	11.7	11.7	3	1	33.3	33.3
Totals	60	100.0	100.0	43	6	14.0	14.0

Average age of the patients at the time of admission or operation for these hernias was 40.7 years.

great variation in the recurrence rate according to the age of the patient at the time of repair.

Epigastric Recurrences. The average age of the patients at the time of repair was 52.4 years, giving an average duration of 4.7 years.

Sex

Primary Epigastric Hernias. Males predominated, 65.0 per cent, among the patients with this type hernia, but not to such a degree as was found to be the case with incomplete indirect inguinal hernias, 88.7 per cent. It is interesting to note that the recurrence rate among females, 26.7 per cent, was nearly four times that found in males, 7.1 per cent.

Table 4

Sex

Primary Hernias

Sex	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences
Male	39	65.0	28	2	7.1
Female	21	35.0	15	4	26.7
Totals	60	100.0	43	6	14.0

Table 5

Recurrent Hernias

Male	7	87.5	5	1	20.0
Female	1	12.5	1	0	0.0
Totals	8	100.0	6	1	16.7

These hernias were all recurrent epigastric hernias with the exception of one which was situated below the umbilicus just to the right of the midline, as noted in the text. This footnote applies to all tables on recurrent hernias in Part 1.

Epigastric Recurrences. A greater proportion of these hernias, 87.5 per cent, were found in males than was the case with the primary hernias. The only recurrence developed in a male patient.

Race

Primary Epigastric Hernias. Of the 60 hernias studied in this group 90.0 per cent were in white and 10.0 per cent in negro patients. All of the recurrences were discovered in white patients.

Epigastric Recurrences. These hernias were all found in white patients as contrasted to the above. (See tables 6 and 7.)

TABLE 6

Color

Primary Hernias

Race	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recur-rences	Per Cent Recurrences
White	54	90.0	38	6	15.8
Negro	6	10.0	5	0	0.0
Totals	60	100.0	43	6	15.8

TABLE 7

Recurrent Hernias

White	8	100.0	6	1	16.7
Negro	0	0.0	..	..	...
Totals	8	100.0	6	1	16.7

TABLE 8

History of Definite Trauma as Etiologic Factor

Primary Hernias

Trauma as Etiology*	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recur-rences	Per Cent Recurrences
Absent	49	81.7	33	4	12.1
Positive*	11	18.3	10	2	20.0
Totals	60	100.0	43	6	14.0

TABLE 9

Recurrent Hernias

Absent	6	75.0	4	1	25.0
Positive*	2	25.0	2	0	0.0
Totals	8	100.0	6	1	16.7

*Undoubtedly all or a major part of these hernias were present before the incidence of the trauma, which served only to call the patients' attention to the presence of the hernia. In this connection it is interesting to note that, among the 305 complete (congenital) indirect inguinal hernias studied, a history of definite trauma as the etiologic factor in the development of their hernia was given by 26 per cent of the patients. (Shelley, Harold J.: Complete Indirect Inguinal Hernias. A Study of 305 Hernias and Repairs, South. Surgeon *9:* 257 (April) 1940.)

Trauma

These figures are given as a matter of interest only. In their consideration, one must bear in mind the fact that among the 305 complete (congenital) indirect inguinal hernias studied, a history of a definite trauma as the etiologic factor in the development of their hernias was given by 26 per cent of the patients who first noted their hernias after the age of 15 years.[1]

Primary Epigastric Hernias. Among the patients with this type of hernia, 18.3 per cent gave a history of a definite trauma as the etiologic factor in the development of their hernias. As with other types of hernias, this trauma in all or part of these patients probably served only to call their attention to the presence of the hernias.

Epigastric Recurrences. One-fourth of these patients gave a history of a definite trauma as the etiologic factor in the development of their hernias. The inaccuracy of this figure has just been discussed.

SYMPTOMATOLOGY

Pain

Table 10
History of Pain Associated with Hernia
Primary Hernias

History of Pain	Total Hernias	Per Cent of Entire Group
Absent	16	27.7
Positive	44	73.3
Totals	60	100 0

Table 11
Recurrent Hernias

Absent	3	37.5
Positive	5	62.5
Totals	8	100.0

Primary Epigastric Hernias. The percentage of patients with epigastric hernias who gave a history of pain associated with their hernias, 73.3 per cent, was practically the same as was the case with femoral hernias, 70.7 per cent. This is of interest as both groups are hernias with small openings into the abdominal cavity, and with that opening surrounded by a relatively rigid circumference.

Epigastric Recurrences. Pain associated with these hernias was present in a somewhat smaller proportion, 62.5 per cent, than with the original hernias. They were on the average larger than the original hernias. (See tables 12 and 13).

Duration

The average duration, time elapsed from discovery of the hernias to admission into the hospital or repair, was 4.1 years for the original epigastric hernias and 4.7 years for the recurrences.

PHYSICAL FINDINGS

Table 12

Size

Primary Hernias

Size of Hernia*	Total Hernias	Per Cent of Entire Group	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Operative Deaths 1926-1935	Mortality
Size I	42	70 0	32	2	.3	0 in 27 operations	0.0
Size II	15	25.0	11	4	36.4	0 in 14 operations	0.0
Size III	3	5.0	0	..	...	0 in 2 operations	0.0
Totals	60	100.0	43	6	14.0	0 in 43 operations	0.0

Table 13

Recurrent Hernias

Size I	0	0.0	..	..	...	.....	....
Size II	4	50.0	2	0	0.0	1 in 3 operations**	33.3
Size III	4	50.0	4	1	25.0	1 in 4 operations**	25.0
Totals	8	100.0	6	1	16.7	2 in 7 operations**	28.6

*Size I: Those hernias in which the greatest diameter of the sac was not more than 1½ inches.

Size II: Those hernias in which the greatest diameter of the sac was more than 1½ inches and not more than 2½ inches.

Size III: Those hernias in which the greatest diameter of the sac was more than 2½ inches.

**Both deaths were of patients with strangulated hernias.

Primary Epigastric Hernias. These hernias averaged in size even smaller than the femoral hernias studied. Of the total, 70.0 per cent were classified as Size I, sac not more than 1½ inches in

diameter, as contrasted to 51.8 per cent of the femoral hernias, sac not more than 2½ inches in diameter. Size II, sac more than 1½ and not more than 2½ inches in diameter, were 25.0 per cent of the total; and Size III, sac more than 2½ inches in diameter, only 5.0 per cent.

The recurrence rate for Size I hernias was 6.3 per cent and for Size II, 36.4 per cent. No patients were followed in the group with Size III hernias.

Epigastric Recurrences. Half of these hernias were classified as Size II and half as Size III. (See second paragraph above for definition of sizes.) The only recurrence discovered followed the repair of one of the largest hernias.

The number of repairs was too small for the respective mortality rates to have any comparative value.

Incarceration and Strangulation

Primary Epigastric Hernias. The percentage of these patients which presented incarceration, 41.7 per cent (of omentum only in practically every instance) was the same as that found with femoral

Table 14

Incarceration and Strangulation

Primary Hernias

Incarcerated or Strangulated	Total Hernias	Per Cent of Entire Group	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Operative Deaths 1926-1935	Mortality
Neither	35	58.3	29	2	6.2	0 in 19 operations	0.0
Incarcerated*	25	41.7	14	4	28.6	0 in 24 operations	0.0
Strangulated*	1	1.7	0	..	...	0 in 1 operation	0.0
Totals	60	100.0	43	6	14.0	0 in 43 operations	0.0

*Strangulation developed in an old incarcerated hernia. There was no follow-up.

Table 15

Recurrent Hernias

Neither	4	50.0	4	1	25.0	0 in 3 operations	0.0
Incarcerated**	4	50.0	2	0	0.0	2 in 4 operations**	50.0
Strangulated**	2	25.0	0	..	...	2 in 2 operations**	100.0
Totals	8	100.0	6	1	16.7	2 in 7 operations	28.6

**The two strangulations developed in old incarcerated hernias. Both deaths were the result of strangulation.

hernias, 42.4 per cent. That the figure for strangulation, 1.7 per cent, was so much smaller than that for femoral hernias, 16.7 per cent, was undoubtedly due to the fact that the site of the hernia orifice is situated so much higher in the abdominal wall that ordinarily the only content is omentum.

No postoperative deaths were associated with repairs of either incarcerated or strangulated hernias of this type.

TABLE 16

By Type of Repair

Primary Hernias

Type of Repair*	Total Followed	Per Cent Recurrences	Per Cent** Infections	Per Cent** Infections Showing Recurrences
1. Anatomic	16	12.5	6.3	0.0
2. Anatomic plus overlap	18	16.7	7.1	100.0
3. Transverse repair with overlap	9	11.1	0.0	....
Totals	43	14.0	7.0	50.0

TABLE 17

Recurrent Hernias

1. Anatomic	0 (both died)		50.0	....
2. Anatomic plus overlap	3	33.3	0.0	....
3. Transverse repair with overlap	2	0.0	0.0	....
4. Many-tailed transplant from fascia lata	1	0.0	0.0	....
Totals	6	16.7	12.5	....

*Those repairs were classified as anatomic in which the defect was closed by bringing the anatomic structures together from the two sides of the midline in their normal anatomic relation or by suture in layers of first the peritoneum and posterior rectus sheath, second the rectus muscles, and third the anterior rectus sheaths.

Those were classified as anatomic plus overlap in which the repair described above was used with the exception that the layers as they were brought together were overlapped with two rows of sutures.

Those repairs were classified as transverse with overlap in which the Mayo type of repair was done in which the various anatomic structures were incised transversely and these incisions and the defect closed by overlapping the incised layers.

The defect in the hernia in the fourth group was repaired by placing beneath it a large transplant from the fascia lata. The edges of this transplants were cut into tails which were brought up through the rectus sheaths and muscle and each pair fixed in place by transfixing one with the other.

**The percentages of infections were calculated upon the entire number of repairs in each group. The single infected wound was never examined in the follow-up clinic.

Epigastric Recurrences. Greater proportions of these hernias were incarcerated and strangulated, 50.0 and 25.0 per cent respectively, than of the original hernias. The only recurrence developed following the repair of a hernia which had been neither incarcerated or strangulated.

The 2 postoperative deaths in this group were of patients operated upon for strangulated hernias.

RESULTS ACCORDING TO TYPE OF REPAIR

These figures (tables 16 and 17) are given only to show the types of repairs used. The numbers of followed patients in the various groups were too small for the recurrence rates to have any significance.

A repair by transplantation of fascia lata was done only once, in a recurrent hernia with a large defect in the fascial and muscular structures of the abdominal wall at the site of the hernia. This repair was not followed by a recurrence.

POSTOPERATIVE COMPLICATIONS

Primary Epigastric Hernias. The incidence of postoperative complications was rather high, 21.1 per cent. The incidence of respiratory complications, 5.3 per cent, was lower than that which followed repairs of inguinal hernias, but practically the same as for femoral repairs. The only postoperative circulatory complication was hematoma. The incidence of this, 7.0 per cent, was the highest

TABLE 18

Postoperative Complications

Complication	Total Operations	Per Cent of Entire Group	Average Days in Hospital Postoperative	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Per Cent Infected Wounds	Deaths	Per Cent Mortality
1. Wound infection	4	7.0	26.0	4	3	75.0	...	0	0.0
2. Hematomas	4	7.0	20.5	3	1	33.3	0.0	0	0.0
3. Acute bronchitis	1	1.8	3.0	1	0	0.0	100.0	0	0.0
4. Common cold	1	1.8	15.0	1	0	0.0	0.0	0	0.0
5. Lobar pneumonia	1	1.8	21.0	1	0	0.0	0.0	0	0.0
6. Acute conjunctivitis	1	1.8	14.0	1	0	0.0	0.0	0	0.0
Totals	12	21.1		11	4	36.4	12.5*	0	0.0

These occurred only in the primary hernias.

Excluding those patients whose only complication was wound infection.

found after the repair of any type of hernia with the exception of recurrent umbilical hernias. The reason for this is not apparent.

The incidence of wound infections was 7.0 per cent.

Epigastric Recurrences. The number of repairs in this group was too small for the incidence of complications to have any comparative value.

OPERATIVE MORTALITY

No deaths followed the 43 repairs of primary epigastric hernias done from 1926 to 1935 inclusive. This period of time was used in calculating mortality statistics as all repairs performed were included in the study for that time only.

Two deaths followed operations upon strangulated recurrent epigastric hernias. Seven repairs were performed between 1926 and 1935 (inclusive), so that the operative mortality was 28.6 per cent.

TABLE 19

Postoperative Deaths (1926-1935)

Patient's Age	Duration of Strangulation	Resection Required	Time of Death Postoperative	Cause of Death
58	6 days	Yes	3 days	Recurrence of obstruction due to band of adhesions.
63	2 days	No	2 days	Pulmonary edema.

Two deaths in 7 operations, an operative mortality of 28.6 per cent.
The only deaths occurred in cases of recurrent hernia.

One death followed the resection of a gangrenous loop of ileum which developed 3 days after the operative reduction and repair of a hernia strangulated for 6 days preceding that repair. The other death was due to pulmonary edema 2 days following the repair of a hernia which had been strangulated for 2 days, and in which resection had not been required.

FOLLOW-UP DATA

Primary Epigastric Hernias. Of the 60 hernias of this type studied, 3 were not repaired and 6 patients did not return for follow-up examination.

Forty-three were followed for periods of time of 9 months or longer or until a recurrence was discovered. Six recurrences were discovered, giving a recurrence rate of 14.0 per cent. The average time at which these recurrences were first noted was 11.4 months postoperative.

A total of 51 patients were examined after repair of their hernias for an average time of 28.7 months. For this entire group the recurrence rate was 11.8 per cent.

Epigastric Recurrences. Of the 8 hernias of this type studied, all were repaired. Two patients died. The remaining 6 were all followed for 9 months or longer or until a recurrence was noted. The average follow-up time was 20.0 months. One recurrence was discovered, an incidence of 16.7 per cent. It was first noted 3 months following the repair.

TABLE 20

Follow-Up Data

Primary Hernias

Total number of hernias studied	60
Total—no operation	3
Total operations	57
Total operative deaths	0
Total—no follow-up examination	6
Total—follow-up under 9 months—no recurrences	8
Total—follow-up 9 months and over (incl. recurrences)	43
Average follow-up time—all cases 9 months and over	33.4 months
Total recurrences	6
Average time postoperative recurrences were first noted	11.4 months
Percentage of recurrences—9 month and over follow-up	14.0
Total number of operations examined postoperatively	51
Average follow-up time—all followed cases	28.7 months
Total recurrences	6
Percentage of recurrences—all followed cases	11.8

TABLE 21

Recurrent Hernias

Total number of hernias studied	8
Total—no operation	0
Total operations	8
Total operative deaths	2
Total—no follow-up examination	0
Total—follow-up under 9 months—no recurrences	0
Total—follow-up 9 months and over (incl. recurrences)	6
Average follow-up time—all cases 9 months and over	20.0 months
Total recurrences	1
Average time postoperative recurrences were first noted	3.0 months
Percentage of recurrences—9 month and over follow-up	16.7

All followed cases examined 9 months or more postoperatively.

REPAIR OF EPIGASTRIC HERNIAS

Primary Epigastric Hernias. It is my belief that only a small percentage of epigastric hernias can be repaired satisfactorily by excising them with a longitudinal incision and performing the repair

by bringing the rectus muscles together in the midline over a longitudinal closure of the posterior rectus sheath and peritoneum. A few can be satisfactorily repaired by making a longitudinal incision and a closure by overlapping the wide fascial layer between the two rectus muscles without opening the rectus sheaths.

If either of these two methods of repair is employed, I am convinced that both the immediate and late results will be more satisfactory if careful silk technic is employed throughout the repairs.

When the opening from the hernia into the abdomen is not too large, a satisfactory repair can be done with a transverse incision and the Mayo type of closure, overlapping the various anatomic structures. The finest silk adequate for the needs should be used throughout for sutures and ligatures.

Unless the repair can be readily performed with no tension on the overlapped tissues, better results will follow the use of a suture obtained from the fascia lata. It should be fixed at each point of entrance into and exit from the tissues by fine silk sutures.

Epigastric Recurrences. As in the original repairs a properly applied silk technic should be employed.

For the smaller, more readily repaired hernias of this type, a Mayo repair with overlap of the anatomic structures should be satisfactory. In repair of the moderate sized hernias, this same technic, but with the use of a suture from the fascia lata, will give improved results.

In those hernias which are so large that the defect in the abdominal wall cannot be readily closed by overlapping the structures making up the margin of the opening into the abdominal cavity, closure should be done by a fascial transplant from the fascia lata. This transplant should be sufficiently large that, after tails have been cut around the edges, sufficient fascia remains to extend well beyond the margins of the defect. This transplant is placed beneath the defect, and the tails brought up through the posterior rectus sheath, rectus muscle and anterior sheath. It is then fixed by transfixing one of each pair of tails with the other. The edges of the transplant and the tails are fixed by fine silk sutures.

The utmost care must be used not to traumatize tissues, to obtain complete hemostasis and to leave no dead space in the wound. If this is done and silk is utilized throughout (the finest silk adequate for each suture and ligature), the wound need not be drained, the incidence of infection will be very low and prompt, and firm primary union will ensue.

These patients should wear a suitable abdominal belt for a considerable period of time postoperatively.

Part II

UMBILICAL HERNIAS

A Study of 185 Hernias and 124 Repairs

A TOTAL of 185 umbilical hernias were studied. They comprised 33.6 per cent of all ventral hernias and 4.2 per cent of all hernias studied (table 1). Of the total, 124 were repaired by operation and 92 were followed for periods of time of 9 months or longer or until a recurrence was discovered. The average follow-up time was 36.9 months. Fourteen recurrences were discovered, an incidence of 15.2 per cent.

Primary Umbilical Hernias. Of the 185 umbilical hernias, 168 had not been previously repaired. Of these, 107 were repaired by operation. Seventy-eight were followed postoperatively for periods of time of 9 months or longer or until a recurrence was discovered. Ten recurrences were found, an incidence of 12.8 per cent.

Umbilical Recurrences. All of the 17 recurrent hernias were repaired by operation. Of these, 14 were followed postoperatively for periods of time of 9 months or longer or until a recurrence was discovered. There were 4 recurrences, an incidence of 28.6 per cent.

ETIOLOGIC FACTORS

Age at Which Hernia Was First Noted

Primary Umbilical Hernias. Nearly twice as large a percentage of the umbilical hernias studied were first noted at the time of the patients' birth, 37.5 per cent, than in any decade of life, subsequently. Only 1.8 per cent were first noted in each of the first 2 decades of life, if those noted at birth are not included. This figure increased to 14.3 per cent in the third decade and 20.8 per cent in the fourth. The latter was the greatest 10 year incidence excluding those noted at birth. From that time there was a steady decrease to the ninth decade.

By successive 20 year periods of life, the incidences were 41.1, 35.1, 22.0 and 1.8 per cent.

The average age at which these hernias were first noted was 20.1 years.

The recurrence rates in successive 20 year periods of life showed an increase with increase in the patients' ages.

Umbilical Recurrences. The average age of patients when the recurrences were first noted was 46.1 years.

Primary Umbilical Hernias. In the first decade of life, the per-

TABLE 22

Age at Which Hernia Was First Noted

Primary Hernias

Age Group (in Years)	Total Hernias	Per Cent of Entire Group		Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences	
Noted at birth	63	37.5		11	0	0.0	
1 day to 10 yrs.	3	1.8	41.1	2	0	0.0	6.3
10 to 19 yrs.	3	1.8		3	1	33.3	
20 to 29	24	14.3	35.1	18	1	5.5	14.3
30 to 39	35	20.8		24	5	20.8	
40 to 49	24	14.3	22.0	10	3	30.0	15.8
50 to 59	13	7.7		9	0	0.0	
60 to 69	2	1.2	1.8	1	0	0.0	0.0
70 to 79	1	0.6		0	..	...	
Totals	168	100.0	100.0	78	10	12.8	12.8

Average age at which umbilical hernias were first noted was 20.1 years.

centage of patients admitted to the hospital, 33.3 per cent, was twice that for any other decade. In the second decade this figure was 4.2 per cent. In each subsequent decade the percentage increased to the sixth, after which the two lowest incidences were found.

Greater percentages of repairs, however, were performed in the third, fourth, fifth and sixth than in the first decade of life.

The average age of these patients at the time of admission or operation was 30.2 years.

The majority of recurrences, 7, were found following repairs done on patients in the fourth and fifth decades of life.

The incidence of recurrence increased moderately with increase in age of the patients at the time of operation.

Umbilical Recurrences. The average age of patients with this type of hernia at the time of admission into the hospital or operation was 50.2 years.

TABLE 23

Age at Time of Admission or Operation

Primary Hernias

Age Group (in Years)	Total Hernias	Per Cent of Entire Group		Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences	
0 to 9	56	33.3	47.5	9	1	11.1	6.3
10 to 19	7	4.2		7	0	0.0	
20 to 29	15	8.9	23.2	9	0	0.0	8.7
30 to 39	24	14.3		14	2	14.3	
40 to 49	28	16.7	34.0	17	5	29.4	16.7
50 to 59	29	17.3		19	1	5.2	
60 to 69	5	3.0	5.4	2	0	0.0	33.3
70 to 79	4	2.4		1	1	100.0	
Totals	168	100.0	100.0	78	10	12.8	12.8

Average age at the time of admission or operation for umbilical hernias was 30.2 years.

SEX

Primary Umbilical Hernias. Nearly two-thirds, 63.7 per cent, of the 168 umbilical hernias not previously repaired were in females. The percentage of recurrence in females, 14.8 per cent, was more than double that found in males, 5.9 per cent.

TABLE 24

Sex

Primary Hernias

Sex	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences
Male	61	36.3	17	1	5.9
Female	107	63.7	61	9	14.8
Totals	168	100.0	78	10	12.8

TABLE 25

Recurrent Hernias

Male	0	0.0	..	..	.....
Female	17	100.0	14	4	28.6
Totals	17	100.0	14	4	28.6

Umbilical Recurrences. All of these recurrent umbilical hernias were in females.

RACE

TABLE 26

Color

Primary Hernias

Race	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences
White	134	79.8	66	10	15.2
Negro	34	20.2	12	0	0.0
Totals	168	100.0	78	10	12.8

TABLE 27

Recurrent Hernias

White	17	100.0	14	4	28.6
Negro	0	0.0	..	..	....
Totals	17	100.0	14	4	28.6

Primary Umbilical Hernias. The highest race incidence for negroes among the various types of hernias studied was found to be the case with umbilical hernias, 20.2 per cent. However, no recurrences were found among the repairs performed upon the 12 negro patients who returned for follow-up examination. The recurrence rate among the white patients was 15.2 per cent.

Umbilical Recurrences. The 17 patients operated upon for recurrent umbilical hernias were all members of the white race.

TRAUMA

A total of 14.3 per cent of the patients with primary umbilical hernias and 11.8 per cent of those with recurrent hernias gave a history of a definite trauma as the etiologic factor in the development of their hernias. The trauma probably served only to call these patients' attention to the presence of the hernias. (See foot note under tables 28 and 29.)

SYMPTOMATOLOGY

PAIN

Primary Umbilical Hernias. A history of pain associated with their umbilical hernias was given by 42.9 per cent of the patients. The fact that this figure was materially less than for either type of

epigastric hernia is probably because, on the average, these umbilical hernias have a larger opening between the sac and the abdominal cavity.

TABLE 28

History of Definite Trauma as Etiologic Factor

Primary Hernias

Trauma as Etiology*	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recur-rences	Per Cent Recurrences
Absent	144	85.7	60	7	11.7
Positive*	24	14.3	18	3	16.7
Totals	168	100.0	78	10	12.8

TABLE 29

Recurrent Hernias

Absent	15	88.2	12	4	33.3
Positive*	2	11.8	2	0	0.0
Totals	17	100.0	14	4	28.6

*Undoubtedly all or a major part of these hernias were present before the incidence of the trauma, which served only to call the patient's attention to the presence of the hernia. In this connection it is interesting to note that, among the 305 complete (congenital) indirect inguinal hernias studied, a history of definite trauma as the etiological factor in the development of their hernias was given by 26 per cent of the patients who first noted their hernias after the age of 15 years. (Shelley, Harold J.: Complete Indirect Inguinal Hernias: A Study of 305 Hernias and Repairs, South. Surgeon *9:* 257 (April) 1940.)

TABLE 30

History of Pain Associated with Primary Hernia

History of Pain	Total Hernias	Per Cent of Entire Group
Absent	96	57.1
Positive	72	42.9
Totals	168	100.0

TABLE 31

History of Pain Associated with Recurrent Hernia

Absent	3	17.6
Positive	14	82.4
Totals	17	100.0

Umbilical Recurrences. The histories of the patients with this type of hernia were positive for pain associated with their hernias in 82.4 per cent as contrasted to the figure given above for the primary hernias.

Duration

The average duration (elapsed time from when the hernias were first noted to the time of admission to the hospital or operation) for the primary umbilical hernias was 10.1 years and for the recurrent hernias, 4.1 years.

PHYSICAL FINDINGS

Size

Primary Umbilical Hernias. The majority of the 168 umbilical hernias not previously repaired were rather small. In nearly three-fourths, 71.4 per cent, the greatest diameter of the sac was not

Table 32

Size

Primary Hernias

Size of Hernia*	Total Hernias	Per Cent of Entire Group	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Operative Deaths 1926-1935	Per Cent Mortality
Size I	120	71.4	47	4	8.5	1 in 62 operations	1.6
Size II	30	17.9	19	3	15.8	2 in 18 operations**	11.1
Size III	18	10.7	12	3	25.0	0 in 11 operations	0.0
Totals	168	100.0	78	10	12.8	3 in 91 operations**	3.3

Table 33

Recurrent Hernias

Size I	1	5.9	1	0	0.0	0 in 1 operation	0.0
Size II	5	29.4	4	2	50.0	1 in 5 operations***	20.0
Size III	11	64.7	9	2	22.2	1 in 11 operations***	9.1
Totals	17	100.0	14	4	28.6	2 in 17 operations***	11.8

*Size I: Those hernias in which the greatest diameter of the sac was not more than 2 inches.

Size II: Those hernias in which the greatest diameter of the sac was more than 2 inches and not more than 3 inches.

Size III: Those hernias in which the greatest diameter of the sac was more than 3 inches.

**Two of the 3 operative deaths (both in Size II hernias) were of patients with strangulated hernias. In addition to the 3 operative deaths, two other patients died in the hospital from causes not associated with their hernias. These were patients in whom the umbilical hernias were incidental findings.

***Both deaths were of patients with strangulated hernias.

more than 2 inches. The lowest recurrence rate, 8.5 per cent, followed repairs in this group.

In only 17.9 per cent was the greatest diameter of the sac more than 2 inches and not more than 3 inches. Among those patients followed after repair of this size hernias, the recurrence rate was 15.8 per cent. An even smaller percentage, 10.7 per cent, had sacs with the greatest diameter more than 3 inches. This group showed the highest recurrence rate, 25.0 per cent.

Following repairs of the smaller hernias (Size I), the operative mortality was 1.6 per cent. Grouping Sizes II and III together, this figure was 6.9 per cent. Both of the deaths following repairs of the larger hernias were in patients operated upon because of strangulation of their hernias.

Umbilical Recurrences. These recurrent hernias averaged considerably larger than did the original hernias. Only 5.9 per cent were classified as Size I, 29.4 per cent as Size II and 64.7 per cent as Size III.

Both postoperative deaths followed repair of the larger size hernias which were strangulated.

Multiple Hernias

Table 34

Multiple Hernias Associated with Primary Hernias

Associated with 168 umbilical hernias were:	
Unilateral indirect inguinal	1
Bilateral indirect inguinal	1
Epigastric	7
Incisional hernia	5
Unilateral direct inguinal	2
Bilateral direct inguinal	1
Unilateral indirect inguinal and epigastric	3
Unilateral indirect inguinal and unilateral femoral	2

Umbilical hernias were associated in 17 patients with other single types of hernias (10.1 per cent). In 2 of these the inguinal hernias were bilateral.

Five umbilical hernias were associated in 5 patients each with 2 other types of hernias (2.9 per cent). None of these other inguinal or femoral hernias were bilateral.

Twenty-two umbilical hernias were associated in 22 patients with 29 other hernias (13.1 per cent).

Association in the same patient with other types of hernias was found to occur with 13.1 per cent of these primary umbilical hernias. This is given only as a matter of interest in that for the other types of hernias this figure was only 1.3 to 1.5 per cent.[1]

Incarceration and Strangulation

Table 35

Incarceration and Strangulation

Primary Hernias

Incarcerated or Strangulated	Total Hernias	Per Cent of Entire Group	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Operative Deaths 1926-1935	Per Cent Mortality
Neither	116	69.0	45	4	8.9	1 in 57 operations	1.8
Incarcerated*	45	26.9	29	4	13.8	0 in 28 operations	0.0
Strangulated*	9	5.3	6	3	50.0	2 in 8 operations	25.0
Totals	168	100.0	78	10	12.8	3 in 91 operations**	3.3

*Strangulation developed in 2 old incarcerated hernias. In 1 a recurrence developed, in the other no recurrence was noted in the follow-up examinations.

**In addition to the 3 operative deaths, 2 other patients died in the hospital from causes not associated with their hernias. These were patients in whom the umbilical hernias were incidental findings.

Table 36

Recurrent Hernias

Neither	4	23.5	4	1	25.0	0 in 4 operations	0.0
Incarcerated	10	58.8	9	3	33.3	0 in 10 operations	0.0
Strangulated	3	17.6	1	0	0.0	2 in 3 operations	66.7
Totals	17	100.0	14	4	28.6	2 in 17 operations	11.8

Primary Umbilical Hernias. The proportion of this type of hernia which showed incarceration was considerably less than was found to be the case with epigastric and femoral hernias. Slightly over one-fourth, 26.9 per cent, were incarcerated and recurrences were discovered in 13.8 per cent of the repairs followed postoperatively.

All but one of the strangulated primary umbilical hernias were reduced and repaired by operation (5.3 per cent of the total studied were strangulated). Of the six patients followed, 50.0 per cent were found to have developed recurrences. Two patients died postoperatively, a mortality rate of 25.0 per cent.

Umbilical Recurrences. The percentages of incarcerated and

strangulated hernias, 58.8 and 17.6 per cent, respectively, were much greater than those found in the primary hernias. (See above.)

Both postoperative deaths followed the repair of strangulated hernias.

RESULTS ACCORDING TO TYPE OF REPAIR

TABLE 37

By Type of Repair

Primary Hernias

Type of Repair*	Total Followed	Per Cent Recurrences	Per Cent** Infections	Per Cent** Infections Showing Recurrences
1. Anatomic	19	21.1	10.5	50.0
2. Anatomic plus overlap	13	7.7	0.0	....
3. Transverse repair with overlap	46	10.9	6.5	33.3
Totals	78	12.8	6.5	40.0

*Those repairs classified as anatomic were the ones in which the defect was closed by bringing the anatomic structures together from the two sides of the midline in their normal anatomic relation or by suture in layers of first the peritoneum and posterior rectus sheath, second the two rectus muscles, and third the anterior rectus sheaths.

Those classified as anatomic plus overlap were the same as described above with the exception that the layers as they were brought together were overlapped each with two rows of sutures.

The third group were those repaired by the Mayo type of operation in which the various anatomic structures were incised transversely and these incisions and the defect closed by overlapping the incised layers.

**The percentages of infections were calculated upon the entire number of repairs in each group. The percentages of infected wounds showing recurrences were calculated according to the number of recurrences found among the total infected wounds in each group which were examined in the follow-up clinic over periods of time of 9 months or longer.

Primary Umbilical Hernias. All of the 78 patients followed postoperatively had had their hernias repaired without the use of fascial sutures. The highest recurrence rate, 21.1 per cent, followed the use of that type of repair in which the various anatomic structures on the two sides of the midline of the abdominal wall were only brought into approximation.

The lowest figure, 7.7 per cent, was obtained when this method of repair was used with the addition of overlapping the various layers. However, the number followed, 13, was too small for this to be an accurate criterion of this method of closure.

Among the 46 patients followed after a repair by the Mayo overlap, 10.9 per cent recurrences were found.

The numbers of repairs in each group were probably too small for the incidences of wound infection to have any comparative value.

Umbilical Recurrences. The number of repairs was too small for the figures relating to the various types of repairs to be significant. Recurrences followed 25.0 per cent of the repairs done without fascial sutures and 20.0 per cent of these wounds became infected. Recurrence followed 50.0 per cent of those repairs done with fascial sutures but there were no wound infections. Only the largest defects were repaired with fascial sutures.

POSTOPERATIVE COMPLICATIONS

TABLE 38

*Postoperative Complications**

Primary Hernias

Complication	Total Operations	Per Cent of Entire Group	Average Days in Hospital Postoperative	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Per Cent Infected Wounds	Deaths	Per Cent Mortality
1. Wound infection	7	6.5	26.0	5	2	40.0	...	0	0.0
2. Hematomas	4	3.7	21.3	2	0	0.0	0.0	0	0.0
3. Lobar pneumonia	2	1.9	27.5	2	0	0.0	0.0	0	0.0
4. Deep phlebitis	1	0.9	19.0	1	0	0.0	0.0	0	0.0
5. Pulmonary embolus	1	0.9	8.0	0	..	...	0.0	1	100.0
6. Pyelitis	1	0.9	27.0	1	0	0.0	0.0	0	0.0
7. Acute otitis media	1	0.9	22.0	1	0	0.0	0.0	0	0.0
Totals	17	15.9		12	2	16.7	0.0*	1	5.9

*Excluding those patients whose only complication was wound infection.

Primary Umbilical Hernias. Following the 107 operative repairs of umbilical hernias, the incidence of complications was 15.9 per cent. Respiratory complications followed 3.7 per cent and circulatory complications, 5.5 per cent of the repairs. The incidence of infected wounds was 6.5 per cent.

Umbilical Recurrences. The incidence of total postoperative complications was 23.5 per cent, respiratory, 5.9 per cent, and circulatory, 17.7 per cent.

A total of 17.7 per cent of the wounds developed infection.

OPERATIVE MORTALITY

Primary Umbilical Hernias. Three postoperative deaths followed the 91 repairs of this type of hernia done in the 10 year period from 1926 to 1935, inclusive, a mortality rate of 3.3 per cent. One patient, age 26 years, died on the eighth postoperative day due to a pulmonary embolus. The hernia was neither incarcerated nor strangulated. The other two deaths followed the operative reduction

TABLE 39

Deaths (1926-1935)

Primary Hernias

Operative Deaths*	Patient's Age	Hernia Strangulated	Duration of Strangulation	Resection Required	Time of Death Postoperative	Cause of Death
1.	26	No	.....	...	8 days	Pulmonary embolus.
2.	52	Yes	3 days	No	Immed.	Toxemia of intestinal obstruction. Arteriosclerosis and myocardial insufficiency.
3.	67	Yes	3 days	No	13 hours	Toxemia of intestinal obstruction. Myocardial insufficiency.

*3 deaths in 91 operations—giving an operative mortality rate of 3.3 per cent.

TABLE 40

Recurrent Hernias

1.	53	Yes	1 week	No	15 hours	Toxemia of intestinal obstruction. Myocardial insufficiency.
2.	76	Yes	3 days	No	10 days	Myocardial insufficiency.

*2 deaths in 17 operations—giving a mortality rate of 11.8 per cent.

and repair of strangulated hernias, each of 3 days duration before admission to the hospital. Neither required a resection.

Umbilical Recurrences: The only deaths in this group followed repairs of strangulated hernias. These two patients were aged 53 and 76 years. Neither required resection although one hernia had been strangulated for one week and the other for three days before admission to the hospital.

FOLLOW-UP DATA

Primary Umbilical Hernias. Of the 168 primary umbilical hernias studied, 61 were not repaired. One hundred seven were operated upon and of these, 3 died postoperatively and 11 did not return for follow-up examination. A total of 78 patients were followed for 9 months or longer or until a recurrence was discovered, with an average follow-up period of 36.0 months. Among these were found 10 recurrences, an incidence of 12.8 per cent. The average time postoperatively at which these recurrences were discovered was 19.3 months.

TABLE 41

Follow-Up Data

Primary Hernias

Total number of hernias studied	168
Total—no operation	61
Total operations	107
Total operative deaths	3
Total—no follow-up examination	11
Total—follow-up under 9 months—no recurrences	15
Total—follow-up 9 months and over (incl. recurrences)	78
Average follow-up time—all cases 9 months and over	36.0 mos.
Total recurrences	10
Average time postoperative recurrences were first noted	19.3 mos.
Percentage of recurrences—9 month and over follow-up	12.8
Total number of operations examined postoperatively	93
Average follow-up time—all followed cases	31.0 mos.
Total recurrences	10
Percentage of recurrences—all followed cases	10.8

TABLE 42

Recurrent Hernias

Total number of hernias studied	17
Total—no operation	0
Total operations	17
Total operative deaths	2
Total—no follow-up examination	1
Total—follow-up under 9 months—no recurrences	0
Total—follow-up 9 months and over (incl. recurrences)	14
Average follow-up time—all cases 9 months and over	43.2 mos.
Total recurrences	4
Average time postoperative recurrences were first noted	38.2 mos.
Percentage of recurrences—9 month and over follow-up	28.6
Total number of operations examined postoperatively same as above.	

A total of 93 patients were examined in the follow-up clinic, for an average follow-up time of 31.0 months. The recurrence rate for all patients followed postoperatively was 10.8 per cent.

Umbilical Recurrences. All of the 17 recurrent umbilical hernias studied were repaired by operation. Two patients died postoperatively and 1 did not return for follow-up examination. The remaining 14 were all followed for periods of time of 9 months or longer. The average follow-up time for these 14 patients was 43.2 months. The average time postoperatively at which the recurrences were first discovered was 38.2 months.

REPAIR OF UMBILICAL HERNIAS

Primary Umbilical Hernias. A total recurrence rate following the operative repair of umbilical hernias of 12.8 per cent is too high. This figure can undoubtedly be reduced considerably by the use of a careful technic utilizing silk for suture and ligature material. In addition, the type of repair to be used in each individual case must be chosen to meet the requirements for that individual hernia.

An anatomic repair with overlapping of the layers in the course of the closure will give good results in properly selected cases. Patients who have associated with their umbilical hernia a marked degree of diastasis recti must of necessity have their hernias repaired in this manner. A considerable proportion of this type will require the use of a fascial suture to give a satisfactory closure.

Many of these hernias can be repaired satisfactorily with the Mayo overlap technic. If the operation is done properly and silk suture and ligature material is used, the recurrence rate will be low, provided the larger hernias or those associated with a definite diastasis recti are not repaired in this manner. For the former, the addition to the technic of the use of fascial suture from the fascia lata will usually give a satisfactory result.

An umbilical hernia will occasionally be found so large that the defect cannot be closed by the adjacent anatomic structures. Also at times one or more associated epigastric hernias will be found separated from the umbilical hernia by only a narrow strip of tissue. Satisfactory repair of these two conditions can be made only by the use of a large, many-tailed transplant of fascia lata by the technic previously described.

The same care as to careful dissection, the utmost respect for tissues, absolute hemostasis and avoidance of formation of dead spaces, apply equally to all types of repairs of umbilical as to other kinds of hernias.

Umbilical Recurrences. The remarks made in regard to repairs of the larger and more difficult umbilical hernias apply equally or more so to the recurrences.

Part III

INCISIONAL HERNIAS

(Postoperative Ventral)

A Study of 297 Hernias and 269 Repairs

A TOTAL of 297 incisional hernias were studied. They comprised 54.0 per cent of the ventral hernias and 6.7 per cent of all hernias studied. Of these, 269 were repaired by operation. Hernias, which developed after repairs of incisional hernias, were included in this list as they were considered to be still incisional hernias. Of the 269 hernias repaired, 207 were followed postoperatively for periods of time of 9 months or longer, or until a recurrence was discovered, the average time being 26.0 months. A total of 37 recurrences were discovered, giving a recurrence rate of 17.8 per cent.

ETIOLOGIC FACTORS

Age at Time Hernia Was First Noted

The average age of the patients when these incisional hernias were first noted was 38.1 years. The figures for the various age groups were not tabulated as the age at onset was determined en-

Table 43

Age at Time of Admission or Operation

Age Group (in Years)	Total Hernias	Per Cent of Entire Group		Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences	
0 to 9	5	1.7	5.1	4	0	0.0	8.3
10 to 19	10	3.4		8	1	12.5	
20 to 29	38	12.8	39.4	25	2	8.0	9.0
30 to 39	79	26.6		64	6	9.4	
40 to 49	78	26.3	44.4	54	16	29.6	26.4
50 to 59	53	18.1		37	8	21.1	
60 to 69	30	10.1	11.5	15	4	26.7	26.7
70 to 79	4	1.4		0	..	...	
Totals	297	100.0	100.0	207	37	17.8	17.8

Average age at the time of admission or operation for incisional hernia was 42.3 years.

tirely by the patient's age at the time of the original operation and the time that had elapsed after the operation before the hernia developed.

Age at Time of Admission or Operation

The age incidence at the time of admission to the hospital or operation was 1.7 per cent for the first decade of life and increased with each decade to the fourth which was 26.6 per cent. The same figure held for the fifth decade. The incidence decreased through the following 3 decades to 1.4 per cent for the eighth decade of life. The average age of the patients at the time of admission to the hospital or operation was 42.3 years.

Each of the two first twenty year periods of life (age at the time of operation) showed essentially the same recurrence rates, 8.3 and 9.0 per cent respectively. Likewise the third and fourth twenty year periods presented equal recurrence rates, 26.4 and 26.7 per cent respectively.

Sex

The sex incidences of these incisional hernias were essentially the same as were found with umbilical hernias. The figures were males 32.7 per cent and females 67.3 per cent. However, in this instance

Table 44

Sex

Sex	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences
Male	97	32.7	66	11	16.7
Female	200	67.3	141	26	18.4
Totals	297	100.0	207	37	17.8

the preponderance of females was undoubtedly due, largely at least, to the fact that a greater number of females have abdominal operations than do males.

The recurrence rates were not greatly different for the two sexes, males 16.7 and females 18.4 per cent, respectively.

Race

Only 4.7 per cent of the 297 incisional hernias studied were found in negro patients. The number of repairs in these patients was too small for the recurrence rates to have any value for purposes of comparison.

TABLE 45

Color

Race	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences
White	283	95.3	199	36	18.1
Negro	14	4.7	8	1	12.5
Totals	297	100.0	207	37	17.8

TRAUMA

It is interesting that only 5.1 per cent of these patients gave a history of a definite trauma as the etiologic factor in the development of their hernias. Also it is interesting, but in such a small number of cases not particularly significant, that of the 11 of these patients followed, 45.4 per cent were found to have developed recurrences.

TABLE 46

History of Definite Trauma as Etiologic Factor

Trauma as Etiology	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recurrences	Per Cent Recurrences
Absent	282	94.9	196	32	16.3
Positive*	15	5.1	11	5	45.4
Totals	297	100.0	207	37	17.8

*Undoubtedly all or a major part of these hernias were present before the incidence of the trauma, which served only to call the patients' attention to the presence of the hernia. In this connection it is interesting to note that, among the 305 complete (congenital) indirect inguinal hernias studied, a history of definite trauma as the etiologic factor in the development of their hernias was given by 26 per cent of the patients who first noted their hernias after the age of 15 years. (Shelley, Harold J.: Complete Indirect Inguinal Hernias. A Study of 305 Hernias and Repairs, South. Surgeon *9:* 257 (April) 1940.)

The remarks, made as to the role trauma plays in the etiology of other types of hernias, apply equally to incisional hernias.

SYMPTOMATOLOGY

PAIN

A history of pain was given by 56.8 per cent of these patients as having been associated with their hernias. This of course depended largely upon the location of the hernias, the size of their openings

into the abdominal cavity and the nature of their contents. All these factors varied greatly both individually and as to their combinations.

TABLE 47

History of Pain Associated with Hernia

History of Pain	Total Hernias	Per Cent of Entire Group
Absent	128	43.2
Positive	169	56.8
Totals	297	100.0

DURATION

One-fourth of these hernias were admitted to the hospital or repaired within 6 months of the time at which they were first noted. Less than half, 42.4 per cent, were admitted or repaired within the first year after discovery. Nearly three-fourths, 73.4 per cent, within the first 5 years, and nearly all within the first 10 years, 88.5 per cent. The average duration, elapsed time from when the hernias were first noted to the time of admission to the hospital or operation, was 4.2 years.

TABLE 48

Time Hernia Was First Noted to Time of Admission or Operation

Duration	Total Hernias	Per Cent of Entire Group	Number Followed Post-operative	Number of Recur-rences	Per Cent Recurrences
To 1 week	14	4.7	10	1	10.0
To 1 month	24	8.1	17	2	11.8
First 6 months	75	25.2	59	8	13.6
Second 6 months	51	17.2	35	6	17.1
To 1 year	126	42.4	94	14	14.9
0 to 5 years	218	73.4	160	26	16.2
5 to 10 years	45	15.1	30	8	26.7
0 to 10 years	263	88.5	190	34	17.9
10 to 20 years	25	8.4	12	3	25.0
20 to 30 years	7	2.4	5	0	0.0
30 to 40 years	1	0.35	0	..	...
40 to 50 years	1	0.35	0	..	...
Totals	297	100.0	207	37	17.8

Average duration, elapsed time from when hernia was first noted to time of admission or operation, for incisional hernias was 4.2 years.

According to the various figures, increase in the length of time which these patients kept their incisional hernias before repair definitely increased the probability of recurrence. Of course these figures are somewhat distorted by the fact that a considerable proportion of the larger hernias were repaired early due to the discomfort and inconvenience they caused the patients. Others, as they increased in size, were in a considerable proportion repaired when they reached such a size that the resultant discomfort and inconvenience caused the patients to determine to have the repair undertaken.

The second 6 months duration showed an increased recurrence rate of 17.1 per cent as compared to 13.6 per cent for the first 6 months duration. The second five years duration presented an even greater increase over the first five years, 26.7 and 16.2 per cent respectively. About the same difference was found between the second and first ten year periods of duration, 25.0 and 17.9 per cent, respectively.

PHYSICAL FINDINGS

Size

Less than one-fourth, 22.6 per cent, of the 297 incisional hernias studied had sacs in which the greatest diameter was not more than 2 inches. Thirty-four per cent had sacs with the greatest diameter more than 2 inches and not more than 3½ inches, and 43.4 per cent had sacs with the greatest diameter more than 3½ inches. The recurrence rates for the first two groups were the same, 14.5 and

TABLE 49

Size of Hernia*	Total Hernias	Per Cent of Entire Group	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Operative Deaths 1926-1935	Per Cent Mortality
Size I	67	22.6	55	8	14.5	0 in 39 operations	0.0
Size II	101	34.0	63	9	14.3	0 in 64 operations	0.0
Size III	129	43.4	89	20	22.5	5 in 74 operations**	6.7
Totals	297	100.0	207	37	17.8	5 in 177 operations	2.8

*Size I: Those hernias in which the greatest diameter of the sac was not more than 2 inches.

Size II: Those hernias in which the greatest diameter of the sac was more than 2 inches and not more than 3½ inches.

Size III: Those hernias in which the greatest diameter of the sac was more than 3½ inches.

**All 5 deaths were of patients with strangulated hernias.

14.3 per cent respectively, while that for the group with the largest sacs was 22.5 per cent.

All of the 5 postoperative deaths followed repairs of strangulated hernias in which the sacs had a diameter greater than 3½ inches.

Incarceration and Strangulation

More than one-third, 37.5 per cent, of these hernias were incarcerated, and 5.1 per cent were strangulated. The recurrence rate following repairs of incarcerated hernias was only slightly greater than when this complication was not present, 18.1 and 16.1 per cent respectively. However, the recurrence rate following repairs of strangulated incisional hernias was 50.0 per cent.

Table 50

Incarceration and Strangulation

Incarcerated or Strangulated	Total Hernias	Per Cent of Entire Group	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Operative Deaths 1926-1935	Per Cent Mortality
Neither	178	59.9	137	22	16.1	0 in 93 operations	0.0
Incarcerated**	112	37.5	72	13	18.1	5 in 79 operations**	6.3
Strangulated**	15	5.1	6	3	50.0	5 in 13 operations**	38.5
Totals	297	100.0	207	37	17.8	5 in 177 operations**	2.8

**8 hernias developed strangulation which had been incarcerated previous to the strangulation: 5 died, 2 showed no recurrence, 1 developed a recurrence.

**Two other patients entered the hospital with strangulation in previously incarcerated hernias. They were too ill to be operated upon and both died.

None of the patients died following repairs of these hernias which were neither incarcerated or strangulated. Five deaths followed repairs of incarcerated hernias, but in each instance strangulation had developed in a previously incarcerated hernia. The same held true for the 2 non-operative deaths of patients with incarcerated incisional hernias.

Five deaths followed operative reduction and repair of strangulated incisional hernias, giving an operative mortality of 38.5 per cent. Two other patients died who were admitted in extremis with strangulated hernias, their condition being such that operative intervention could not be undertaken.

RESULTS ACCORDING TO TYPE OF OPERATION

That anatomic repairs should have given a recurrence rate, 16.9 per cent, equal to or slightly lower than that for the same procedure to which was added an overlap of the various layers of tissues, 18.0 per cent, would have been unexpected except for the fact that on the average the latter technic was used with the larger and more difficult repairs.

TABLE 51

By Type of Repair

Type of Repair*	Total Followed	Per Cent Recurrences	Per Cent** Infections	Per Cent** Infections Showing Recurrences
Anatomic	59	16.9	14.7	44.4
Anatomic plus overlap	122	18.0	13.1	23.3
Transverse repair with overlap	3	66.7	33.3	0.0
Suture from fascia lata	21	14.3	28.6	33.3
Many-tailed fascial transplant	2	0.0	0.0	0.0
Repairs without fascial sutures	184	18.5	14.5	...
Repairs with fascial sutures	23	13.0	26.1	...
Totals	207	17.8	15.5	29.6

*Those repairs classified as anatomic were the ones in which the defect was closed by bringing the structures together in their normal anatomic relations.

Those classified as anatomic plus overlap were the same as the above with the exception that the layers as they were brought together were overlapped, each with two rows of sutures.

Those classified as transverse repair with overlap were those repairs of small hernias in the midline in which the various anatomic layers were incised transversely and these incisions and the defect closed by overlapping the incised layers.

Those classified as suture from the fascia lata were the repairs in which the defect was closed by using a suture obtained from the fascia lata.

Those classified as many-tailed fascial transplant were repaired by placing a large transplant from the fascia lata beneath the defect and fixing it in place by bringing the many tails cut along its edges up through the abdominal muscles and anchoring each pair by transfixing one end with the other.

**The percentages of infections were calculated upon the entire number of repairs in each group. The percentages of infected wounds showing recurrences were calculated only upon those returning to the follow-up clinic.

Gallie sutures and Gallie many-tailed transplants were used only in those hernias where repair by other technics were considered impractical or impossible. That only 13.0 per cent of such repairs examined in the follow-up clinic were found to have developed recurrences as contrasted to 18.5 per cent for technics without the use of fascial sutures or transplants would indicate that this technic is a most worth while procedure.

The incidence of infected wounds, 15.5 per cent, was much too high. This undoubtedly can be reduced by proper technic and the use of silk suture and ligature material.

POSTOPERATIVE COMPLICATIONS

Over one-fourth, 28.6 per cent, of the repairs of incisional hernias were followed by the development of postoperative complications. The relative order of incidence of the more common complications was not materially different from that which followed the repair of the various other types of hernias. Wound infection accounted for more than half of these complications.

TABLE 52

Postoperative Complications

Complication	Total Operations	Per Cent of Entire Group	Average Days in Hospital Postoperative	No. Followed Postoperative	Number of Recurrences	Per Cent Recurrences	Per Cent Infected Wounds	Deaths	Per Cent Mortality
1. Wound infection	42	15.5	24 2	27	8	29.6	...	0	0.0
2. Acute bronchitis	9	3.3	21.7	8	2	25.0	22.2	0	0.0
3. Hematomas	8	3.0	17.2	7	2	28 6	25.0	0	0.0
4. Bronchopneumonia	4	1.5	34.0	2	1	50.0	25.0	1	25.0
5. Myocardial insufficiency	3	1.1	3.3	0	..	...	0.0	3	100.0
6. Common cold	2	0.7	20.0	2	0	0.0	0.0	0	0.0
7. Pyelitis	2	0.7	29.0	1	0	0.0	0.0	0	0.0
8. Lobar pneumonia	1	0.37	19.0	1	0	0.0	0.0	0	0 0
9. Atelectasis—right lower lobe	1	0.37	16.0	0	..	...	0.0	0	0 0
10. Pleurisy	1	0.37	16.0	0	..	...	0.0	0	0.0
11. Postoperative intestinal obstruction	1	0.37	6.0	0	..	...	0.0	1	100.0
12. Angina pectoris	1	0.37	69.0	1	1	100.0	0.0	0	0.0
13. Fecal fistula	1	0.37	45.0	1	1	100.0	100.0	0	0.0
14. Postoperative psychosis	1	0.37	7.0	1	0	0.0	0.0	0	0.0
15. Totals	77	28.6		51	15	29.4	33.3	5	6.9

Respiratory complications developed slightly more frequently, 6.6 per cent, than following repairs of other ventral hernias, but less frequently than developed after repairs of inguinal hernias.

Circulatory complications developed following 4.5 per cent of these repairs which was less than followed repairs of other types of ventral hernias but more than with inguinal hernias.

OPERATIVE MORTALITY

The 5 deaths, which occurred following the 177 consecutive repairs of incisional hernias in the ten year period from 1926 to 1935 inclusive, were all of patients with strangulated hernias. This gave

TABLE 53

Deaths (1926-1935)

Operative Deaths*	Patient's Age	Hernia Strangulated	Duration of Strangulation	Resection Required	Time of Death Postoperative	Cause of Death
1.	46	Yes	15 hours	No	7 days	Recurrent intestinal obstruction due to a band of adhesions.
2.	56	Yes	12 hours	No	24 hours	Toxemia of intestinal obstruction. Myocardial insufficiency.
3.	58	Yes	7 hours	No	28 hours	Arteriosclerotic heart disease. Myocardial insufficiency.
4.	67	Yes	14 hours	No	14 hours	Toxemia of intestinal obstruction. Myocardial insufficiency.
5.	73	Yes	10 days	Yes**	12 hours	Toxemia of intestinal obstruction. Peritonitis. Bronchopneumonia.
Non-Operative Deaths						
1.	64	Yes	12 hours	...	.....	Peritonitis.***
2.	70	Yes	7 days	...	.....	Toxemia of intestinal obstruction. Myocardial insufficiency.

*Five deaths in 177 operations—giving an operative mortality of 2.8 per cent.

**This patient entered the hospital with a perforation of a gangrenous loop of ileum.

***This patient was admitted in extremis with a perforation of a gangrenous loop of ileum. The other non-operative death was of a patient admitted to the hospital in extremis, too ill to justify operative intervention.

an operative mortality of 2.8 per cent. The ages of these patients ranged from 46 years to 73 years. The sites of the incisions in which these hernias were situated were: 1 upper right rectus, 1 lower left rectus, 1 McBurney and 2 lower midline. In but 1 case was a resection of a gangrenous loop of intestine necessary. This loop had perforated preoperatively.

Two non-operative deaths occurred in patients with strangulated incisional hernias. Both were in extremis at the time of admission to the hospital and operative intervention was impossible. One of these patients was 64 years of age and the other 74. One hernia was in a lower right rectus incision and the other in a McBurney incision.

FOLLOW-UP DATA

Of the 297 incisional hernias studied, 28 were not repaired. Of the latter, 2 patients, who at the time of admission were too ill for operative intervention, died because of strangulation of the hernia. Following the 269 operative repairs, 5 patients died postoperatively and 33 patients did not return for follow-up examination.

TABLE 54

Follow-Up Data

Total number of hernias studied	297	
Total—no operation	28	
Total operations	269	
Total operative deaths	5	
Total non-operative deaths (due to strangulation)	2	
Total—no follow-up examination	33	
Total—follow-up under 9 months—no recurrences	22	
Total—follow-up 9 months and over (incl. recurrences)	207	
Average follow-up time—all cases 9 months and over	36.0	mos.
Total recurrences	37	
Average time postoperative recurrences were first noted	24.0	mos.
Percentage of recurrences—9 month and over follow-up	17.8	
Total number of operations examined postoperatively	229	
Average follow-up time—all followed cases	33.0	mos.
Total recurrences	37	
Percentage of recurrences—all followed cases	16.1	

A total of 207 patients were followed for periods of time of 9 months or more with an average follow-up time of 36.0 months. Thirty-seven recurrences were discovered which gave a recurrence rate of 17.8 per cent. The average time postoperative at which these recurrences were discovered was 24.0 months.

A total of 229 patients were examined in the follow-up clinic with an average follow-up time of 33.0 months. The recurrence rate for the entire group examined postoperatively was 16.1 per cent.

Statistics according to the sites of the incisions in which these hernias were found were not tabulated for the following reasons:

1. The percentages of the various types of incisions making up the original groups of operations following which these hernias developed were not known, so that figures as to the incidences of hernias in the various types of incisions among the entire group of incisional hernias studied would have no value.

2. So many different incisions were included in the group of incisional hernias that the recurrence rates, etc., for each sub-group would have had no value in attempting to draw conclusions, or for purpose of comparison.

REPAIR OF INCISIONAL HERNIAS

The general remarks, made in regard to repair of the various types of hernias other than incisional, apply equally to this type. In these repairs, if satisfactory healing and absence of recurrence are to ensue, the greatest care must be taken to dissect cleanly with a minimum of trauma. Lysis of adhesions between the loops of intestines in the hernia sac with careful peritonealization of all raw surfaces will minimize the possibility of future partial or complete intestinal obstruction in each patient where this condition is present. I feel that fewer of these patients will develop harmful adhesions if amfetin is instilled into the peritoneal cavity before it is closed, but cannot substantiate this assertion with definite figures.

If, in addition to the utmost care to keep tissue traumatization at a minimum, silk ligatures and sutures are utilized, using the smallest size of silk adequate to meet the requirements and including as small an amount of tissue as possible in the sutures and ligatures, prompt healing will result in the incisions without serum formation. This in turn will reduce the incidence of wound infections and result in stronger repairs.

The figures given in this study establish that the use of fascial sutures in the repairs of the larger hernias and of those in which the defect is closed with difficulty gives better results than are obtained by the use of catgut suture material alone. Also the figures would indicate that in this group of hernias many should have been repaired with fascial sutures which were not. Undoubtedly, the use of silk instead of catgut would have given better results than were obtained without its use. However, I am of the opinion that, even when silk technic is used routinely, fascial sutures should also be used in the more difficult repairs.

In those few hernias in which it is impossible to close the defect with the tissues about the hernia opening, a many-tailed transplant of fascia lata should be utilized for this purpose in the manner previously described.

A minimum of three weeks in bed postoperatively should be insisted upon except in the case of some of the very small, easily repaired hernias such as are seen at the drainage site in McBurney incisions. Those patients with unusually large hernias and particularly those who are extremely obese should be kept in bed for periods of time even longer than three weeks.

Immediately postoperative, fluids should be administered in sufficient quantities. Preoperatively and postoperatively these patients should be given food and vitamins sufficient to assure probability of adequate healing power in the tissues. From the time these patients

reach their beds following operation, their positions should be changed frequently and active motion of the legs and arms must be insisted upon.

All possible precautions should be taken to keep the respiratory postoperative complications at a minimum. Refusal to operate upon patients with even the slightest indications of a cold, clearing up of sinus infections before any operative procedure is undertaken, anesthesia only by competent anesthetists and administration of carbon dioxide postoperatively when indicated, are among the measures which will aid in eliminating a considerable percentage of these complications.

Careful instructions to these patients when they leave the hospital as to increasing their activities gradually and for a considerable period of time avoiding any work or exercise which might throw too great a strain upon the repair in the period when the new connective tissue is maturing, is of great importance. Otherwise many patients will put too great a strain upon these repairs. All patients with the exception of those having had the simplest and easiest repairs should wear a suitably fitted and adequate abdominal belt for at least 6 months to a year. Those patients who have had very large hernias repaired and those who are extremely obese probably should wear their binders for the remainder of their lives at all times when they are up and about.

Before repair of an incisional hernia in obese patients, or any other type of hernia for that matter, their weight should be reduced materially if at all possible. This is an ideal, however, which can but rarely be attained as the majority of these patients will not cooperate actively in this respect, notwithstanding their vociferous approval of the idea.

1213 Medical Arts Bldg.

REFERENCE

Shelley, Harold J.: Complete Indirect Inguinal Hernias. A Study of 305 Hernias and Repairs, South. Surgeon *9:* 257 (April) 1940.

SOME COMMONLY SEEN FRACTURE CASES IN WHICH BAD RESULTS FREQUENTLY OCCUR

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STANDARDIZATION in fracture treatment is far from a reality. Because of the great variety of injuries many fractures require individualization of treatment. We wish to present here certain illustrative fracture cases which demonstrate points of value in technic and serious problems with which we are often confronted.

COMPOUND FRACTURES

Although there is a wide divergence of opinion as to the value of chemical agents, and among the advocates of closed versus open methods, there are certain salient points upon which we most all agree which we wish to reemphasize here.

1. Debridement must be thorough.
2. Mechanical cleansing with green soap and water is of utmost value.
3. Accurate reposition of the bone fragments.
4. Thorough immobilization.

In certain cases immediate closure of the wound is indicated. In those cases with marked destruction of soft parts and contamination with soil the wound is best treated by the open method using vaseline packs or dakinization.

During the period of time that elapses after the admission of the patient prior to the operation we feel that a voluminous compress of 70 per cent alcohol has a definite value. Attempt at reduction of protruding bone fragments should be postponed until after adequate surgical preparation of the wound. Immobilization must be adequate and absolute and may be accomplished by plaster, single pin skeletal traction (or wire) or double pin skeletal traction (fig. 1, a, b and c). In this case debridement of the bone was done and with the operation was combined a plastic procedure to provide a covering for the exposed bone, which we feel is most essential. The denuded area on the lateral side of the leg was later covered by small deep skin grafts. This case was complicated by a positive Wassermann of the blood and it was necessary for the leg to remain in the double Steinmann pin traction apparatus for three months before the application of a cast. A good result was ultimately secured. In most cases a plaster cast can soon be applied incorporating the Steinmann pin or Kirschner wires.

Read before the Postgraduate Surgical Assembly (eleventh annual meeting) of The Southeastern Surgical Congress, Birmingham, March 11, 12 and 13, 1940.

Figures 6, a, b and c, and Figures 7, a and b, have been already published in The Journal of Bone and Joint Surgery. Permission to use the cuts here is gratefully acknowledged.

Fig. 1, a. Compound fracture tibia and fibula.

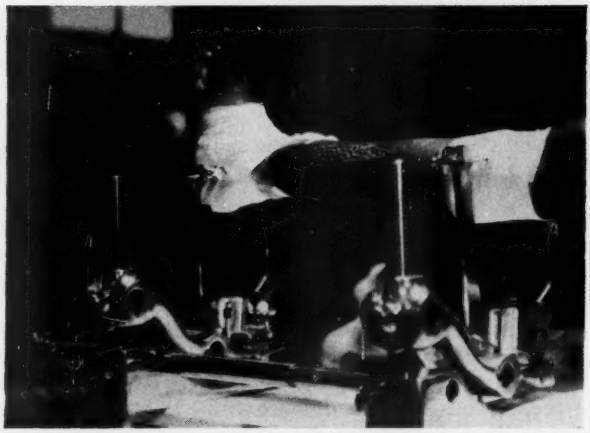

Fig. 1, b. After debridement, plastic and closed reduction with double Steinmann pins.

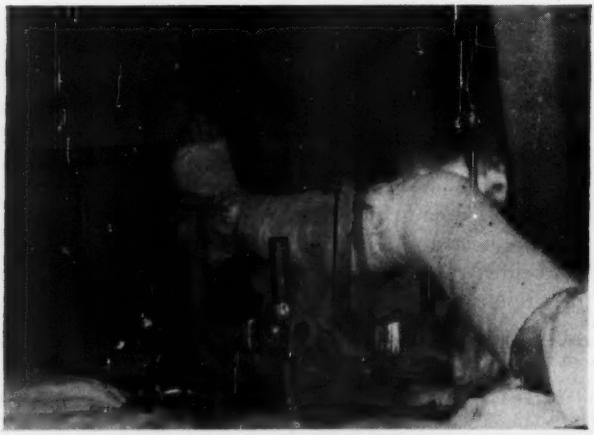

Fig. 1, c. Long leg cast with pins incorporated.

There are two important factors to be remembered in the use of the Steinmann pin. (1) The pin should pass so as to be perpendicular to the intended axis of pull. Otherwise it will slip. (2) Applying the plaster cast over the Steinmann pin should be done in such a fashion that the ends of the pin will be adequately fixed so that they cannot slip laterally. Lateral slipping of the pin may result in infection. The application of pins or wires must be considered a major surgical procedure.

Fig. 2. Compound fracture wrist. Traction by Kirschner wire through metacarpals.

Fractures of the Humerus

Upper two thirds. Among the physiologic factors to be considered in fractures of this region are: (1) Certain fractures and fracture dislocations of the humeral head and anatomic neck require open reduction. (2) Most fractures of the upper humerus displace very little and healing is extremely rapid, taking place in from three to four weeks. (3) The deltoid muscle atrophies very rapidly. (4) The frequent occurrence of periarticular adhesions from prolonged immobilization of the shoulder. Particularly is this true in elderly individuals. In fractures of the upper portion of the humerus healing is usually firm in from three to four weeks and active motion can be resorted to early.

In fractures of the upper third of the shaft with displacement reduction can frequently be accomplished under local analgesia with the patient in the upright position, the elbow flexed to 90 degrees with a sling beneath the wrist and traction being exerted directly

downward at the elbow. The swing cast (fig. 3) was designed by us for this purpose and was described in THE SOUTHERN SURGEON of January, 1933.

Fig. 3. Authors' swing cast for fracture upper third humerus.

In fractures of the upper two thirds of the shaft of the humerus reduction can be accomplished in a similar fashion. Upon admission to the hospital of an acute fracture the hematoma at the fracture site is injected with novocain and a temporary posterior plaster

Fig. 4. Humerus. Onlay graft for nonunion. Subsequent fracture of graft and nonunion in region of vitallium screw. Union occurred after removing screws and drilling bone.

splint applied. With a sling under the wrist the patient is immediately encouraged to be ambulatory. Within twenty-four to forty-eight hours a permanent dressing can be applied with the patient upright without difficulty. A plaster adaptation of the Velpeau

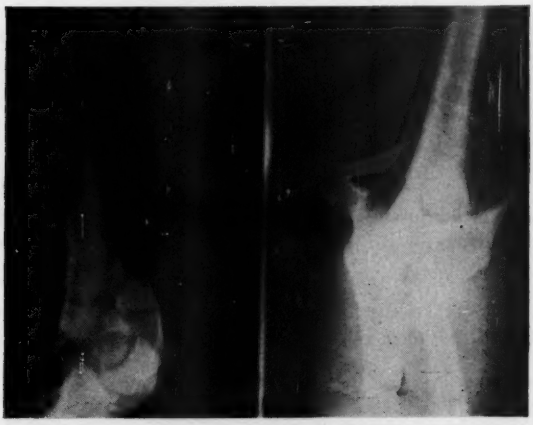

Fig. 5, a. Comminuted fracture distal end humerus.

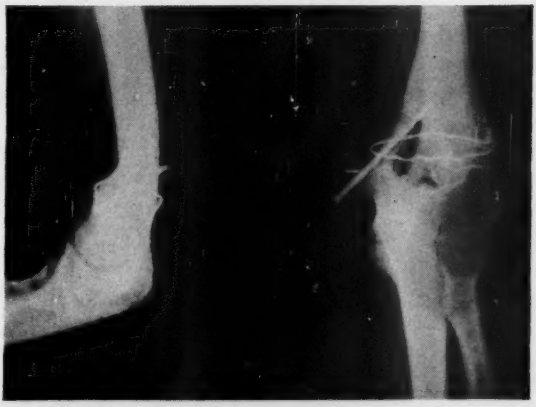

Fig. 5, b. After open reduction with fixation by nail and wires.

Fig. 5, c. Double exposure shows ultimate motion.

bandage is useful for this purpose, is comfortable, requires no sling beneath the wrist, and is worn for about seven weeks at which time active motion is encouraged.

Lower Third of the Humerus

Nonunion (fig. 4) can be a most troublesome complication in the middle third, and the upper portion of the lower third of the humerus. Open reduction may be necessary early because of interposition of soft parts.

Supracondylar fractures in children are usually handled satisfactorily by closed reduction. Those fractures occurring high through the thin portion of the bone have a tendency to rotation. An open operation is frequently necessary with nailing of the lower fragment to the shaft. Double incisions are used when indicated and in the nailing of this type of fracture we prefer to use ordinary carpenter's finishing nails, leaving the heads long so that they can be removed with facility after healing has taken place. Nailing is usually the procedure of choice in fractures of the condyle and epicondyle. In severe injuries about the elbow joint open operation is often the most conservative course (fig. 5, a, b and c), it providing evacuation of the large hematoma, accurate restoration of the bone fragments, and lessens the post traumatic swelling which so frequently causes worry in cases of this type.

Longitudinal Pin Fixation

One troublesome fracture that has been seen by us several times during the past few years is that of comminuted fracture of the upper third of the ulna with anterior dislocation of the head of the radius (fig. 6, a). This fracture is usually received by the patient while riding in an automobile with the flexed elbow protruding through the window of the car, sideswiping some extraneous object. The fracture is the result of direct violence.

In these cases the following technic has evolved itself and has proved most satisfactory.

A longitudinal incision is made over the olecranon and carried down over the surface of the ulna to a point below the fracture site. A modified Steinmann pin having a collar on its proximal end is then drilled longitudinally through the olecranon. The bone fragments are disregarded until the pin has been threaded into the medullary canal of the distal fragment of the ulna. This realigns and adequately fixes the olecranon to the shaft of the ulna, and in so doing the dislocation at the head of the radius is maintained in reduction. The comminuted bone fragments are then placed about the longitudinal pin in the intervening gap and fixed securely by small encir-

cling stainless steel wires (fig. 6, b). Immobilization in plaster is unnecessary because of the absolute fixation of the bone, and active

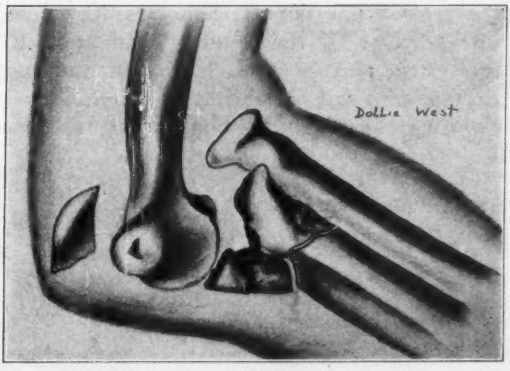

Fig. 6, a. Comminuted fracture proximal end ulna with anterior dislocation head of radius.

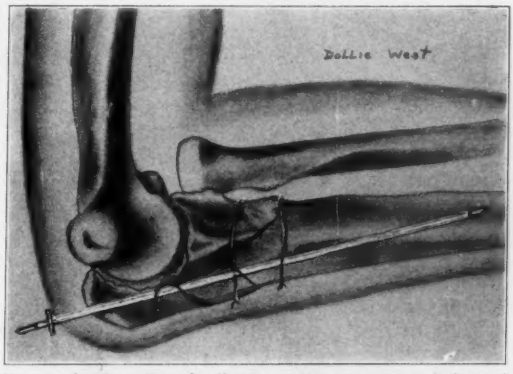

Fig. 6, b. Open reduction. Longitudinal pin has been passed through olecranon and into medullary canal of ulna. Comminuted fragments fixed about pin by encircling stainless steel wires.

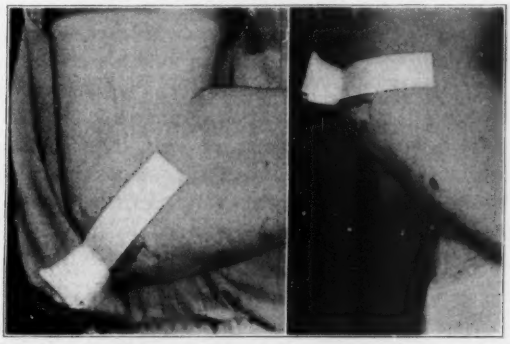

Fig. 6, c. Two weeks after operation. Active motion. Pin is seen protruding.

exercise can be begun as soon as the swelling and soreness permits (fig. 6, c).

In (fig. 7, a and b) this same technic was adapted to a case of subtrochanteric fracture of the femur. Ordinarily in this injury skeletal traction is the treatment of choice, but was contraindicated in this case because of a severe nervous affection. A lateral incision was made exposing the upper portion of the trochanter and the

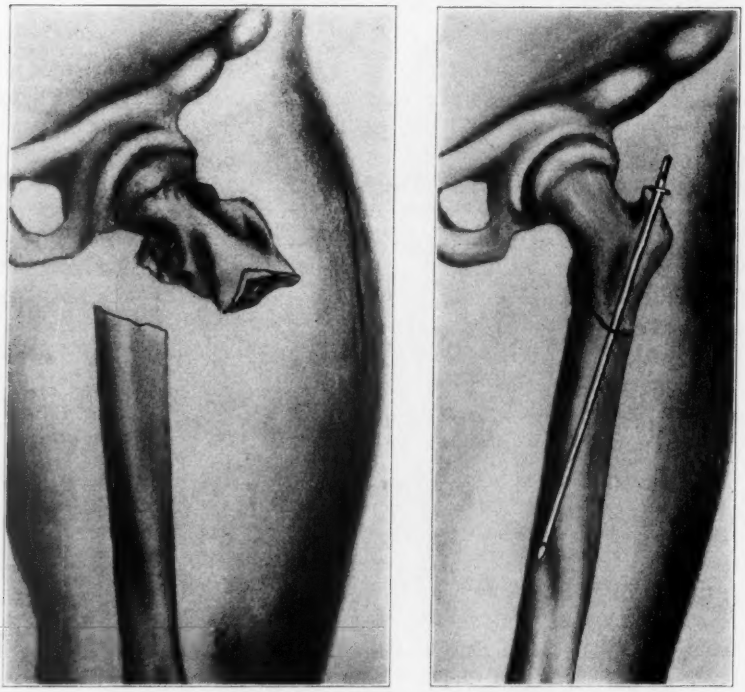

Fig. 7, a. Subtrochanteric fracture femur.
Fig. 7, b. After open reduction and fixation by longitudinal pin.

fracture site. A long pin of the type just described was drilled downward through the surface of the great trochanter in the direction of the long axis of the upper fragment until its point emitted from the mid-portion of the fracture line. It was then threaded into the medullary canal of the lower fragment. Fixation was absolute, and although a plaster cast was used in this case it is doubtful whether or not a plaster cast is necessary. Firm fixation is secured due to the strong pull of the adductors exerted laterally on the pin.

This same technic has also been applied in two cases of fracture of the neck of the humerus with wide displacement. The shaft was fixed to the head of the humerus by passing the longitudinal pin

through the tuberosity and into the medullary canal, allowing the proximal end to protrude through a stab wound on the superior surface of the shoulder. Fixation was absolute, no external immobilization was necessary and active motion was begun at once.

Fractures of the Hip

Intertrochanteric fractures. Fractures in this region usually heal within four weeks. They are easily reduced and can be adequately maintained by a plaster hip spica. In some cases, however, the patient can be more comfortable and the condition can be handled, perhaps, more conservatively by blind nailing or the introduction of pins.

Intracapsular fractures of the femur. It is in the handling of this fracture in the aged that perhaps the most outstanding contribution to surgery has been made in the past few years. Literature on the subject is voluminous and the methods of internal fixation as well as the surgical technic vary widely. Our own preference has been for the guided Smith Petersen nail and it is with this device that our experience has been. The method here described for blind nailing of the hip is a modification of many.

Technic. With the patient on the fracture table a light gas anesthetic is administered. Before attempting to correct the deformity lateral traction is made on the upper third of the thigh by an assistant with countertraction of the body, and while this lateral traction is continued slight longitudinal traction is exerted on the foot followed by marked internal rotation; followed by moderate abduction. When the fragments are satisfactorily disengaged a line drawn through the external and internal malleoli at the ankle will be found to be parallel with the table top. Superior-inferior, and anteroposterior x-rays are essential at this stage. The most common fault of the technic at this stage is a lack of disengagement of the fragments and sufficient internal rotation of the shaft. A 2½ inch incision is made just below the great trochanter and extended to the bone. At a point about 1 inch below the great trochanter a graduated small Steinmann pin is drilled in the direction of the head carrying the wire parallel to the table top and directing it slightly superiorly, being guided by the index finger of an assistant which is placed over the point where the femoral artery crosses beneath Poupart's ligament. This point marks the center of the head of the femur. It is rarely necessary to move the guide wire more than once in this procedure, and the hollow core Smith-Petersen nail is driven in, fixing the shaft to the head, being guided home by the wire. The length nail to be used is predetermined by measurements on the preoperative x-ray film and check-up x-rays with the calibrated pin in position. The wire is then removed and the wound closed in layers in the usual fashion. No immobilization is necessary and active motion can be engaged in as soon as pain permits.

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THE SURGICAL TREATMENT OF CARDIOSPASM

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As understood today the term "cardiospasm" has been a misnomer ever since von Mikulicz first so named the condition in 1882. There was practically no other thought concerning the cause of this condition until after the general use of the x-ray, since which time many cases have been recorded and new theories as to the etiology advanced. We have therefore a number of terms which designate the same pathologic condition; namely, cardiospasm, phrenospasm, preventriculosis, hiatal esophagismus, achalasia of the esophagus or cardia, mego-esophagus or megalo-esophagus, idiopathic or diffuse dilatation of the esophagus, and ectasia of the esophagus. In reviewing the literature, all these terms must be considered as meaning the same condition.

Chronic cardiospasm is that condition in which there is an apparent obstruction at the cardiac end of the esophagus or the hiatal orifice of the diaphragm which does not allow the food to pass readily into the stomach. This obstruction is functional inasmuch as no demonstrable pathologic obstruction can be found at autopsy. Vinson has stated that to make a diagnosis of cardiospasm there must be dysphagia for five to six years without any appreciable increase of the symptoms. Solids and liquids alike pass through the cardia with difficulty. There is no history of trauma to the esophagus such as occurs in lye poisoning. The x-ray reveals a smooth cigar-tip type of obstruction of the cardia with or without dilatation of the esophagus. A 45 olive-tip bougie can be passed on a string without much resistance.

As the synonyms indicate, there must be a variety of these conditions; whether or not these are early and advanced cases of the same condition is debatable. For example there are many cases in which there is an obstruction at the cardia without dilatation above and which are relieved readily by one dilatation. On the other hand, we see the typical advanced case having a greatly dilated esophagus with much atony. These cases are not relieved by one dilatation, and many are not relieved by repeated dilatation on account of the gross anatomic deformity.

Cases of "spasm at the cardia" often connected with a nervous disorder and responding to sedatives or mild antispasmodics or one

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dilatation are not usually classed in this group of chronic cardiospasm. Vinson has called these "spasm at the cardia." As to whether the simple cases are the forerunners of those with the large elongated "S" shaped esophagus, as seen in the chronic cases, is a question. Also there is a question as to whether there are two distinct classes of cases of cardiospasm—one the chronic cardiospasm, and the other the spasm of the cardia, which is mild and always remains so. It has not been determined with certainty whether the severe type, that is the elongated, sac-like, kinked esophagus, is etiologically the same from the beginning or whether it merely represents the further development of an old case of spasm at the cardia, bearing out the theory of a neurologic dystrophy as the cause.

History

The first case of cardiospasm was reported in 1672 by Thomas Willis, who described a typical example and its treatment by an improvised whalebone bougie. In 1733 Hoffmann published a paper on spastic conditions of the lower end of the esophagus. Purton described the first case of idiopathic dilatation of the esophagus in 1821. By 1904 von Mikulicz had collected, from the literature, one hundred cases. Since then the cases have been far more numerous. For example, Vinson with Plummer in 1921 reported a total of 301 cases cared for at the Mayo Clinic. Since then many others have been reported.

Etiology

The exact cause of cardiospasm is not definitely known as the various synonyms for the condition suggest. Von Mikulicz in 1882 considered it due to a spasm of the cardiac sphincter, and named the condition, therefore, "cardiospasm." This theory was the accepted one for years following as evidenced by the persistence of the name and the medical treatment by antispasmodics. This theory is not substantiated by the anatomic structure of the lower esophagus, as no definite sphincter, such as occurs at the pylorus, can be demonstrated. Furthermore antispasmodic drugs such as atropine have no apparent effect on the condition. In a well developed case medical treatment is most discouraging.

Some feel that the circular fibers along with the slightly more prominent elastic tissue in the submucosa at this point produce what may be termed a very weak sphincter action, but in a rather extensive series of observations made post mortem, no actual hypertrophy of this circular muscle could be demonstrated. Further, in passing a bougie or sound no appreciable resistance can be felt. Pathologic dilatation in this disease is far greater than is ever produced by mechanical obstruction such as in neoplasm or stricture. Therefore

it seems more reasonable to assume that loss of tone in the esophageal wall is the cause of the dilatation rather than stenosis.

Hurst in 1913 rejected the spastic theory after demonstrating that a mercury filled rubber tube would pass into the stomach through an apparent spastic sphincter without meeting any appreciable resistance. He felt there was an absence of relaxation of the cardiac sphincter and termed the condition, "achalasia of the cardia." Fluoroscopic examination demonstrated conclusively that there is a failure of the cardia to open. The cause of this failure remains a question. It was Hurst's opinion that the cardia did not open because of a failure of impulses to be transmitted to this area. He based this assumption on the histologic studies of Rake who showed the absence of ganglion cells in Auerbach's plexus.

Jackson in 1922 termed the condition "phrenospasm" and maintained that the crura of the diaphragm acted as shut-off muscles or as a sphincter to the lower end of the esophagus. He was preceded in this idea by Sauerbruch in 1906. A paralysis of the diaphragm, however, does not alter the function of normal sphincteric action in the lower esophagus. The theory, that the hiatus is the cause of the obstruction, cannot be disregarded as shown by the work of Joannides, who demonstrated that voluntary movements of the diaphragm produce corresponding changes in the patency of the cardia. It is further noted that the dilatation always stops at the hiatus. For lack of a more appropriate name Jackson has also called this condition, "preventriculosis."

About the same time as Jackson coined the term "phrenospasm," Mosher concluded that the left lobe of the liver pressed upon the esophagus producing an obstruction. Hence the "liver tunnel" could become narrowed in cases of perihepatitis, and this narowing would explain cardiospasm in cases of gallbladder disease, appendicitis and other abdominal inflammatory conditions. He also advanced the theory that the tip of the lungs might compress the esophagus; also that there occurs a definite kinking or torsion of the enlarged esophagus, and further that long standing cases demonstrate some fibrosis of the lower end of the esophagus. Some of the anatomic findings upon which Mosher based his theories have been shown to be due to post-mortem changes. However, there appears to be no question but that kinking and torsion, along with elongation, is the major factor in this condition. As Mosher has said, "spasm is not the cause, but it makes a bad matter worse."

A more recent theory is that there is a degenerative nerve lesion as mentioned previously. In 1900 Rosenheim stated that the condition was due to a primary atony of the esophageal muscles. Keans in 1912 felt that there was a paralysis of the circular fibers of the

esophagus. Rake in 1927 first demonstrated the absence of the ganglion cells in Auerbach's plexus in the lower third of the esophagus. This has been verified by Mosher and McGregor, also by Lendrum. Hurst in 1934 states, "It is clear therefore that this apparently functional condition is really the result of organic disease of Auerbach's plexus; achalasia of the cardia is in fact the only well established example of a localized disease of the autonomic nervous system."

Scrimger maintains that the cardia is opened by the longitudinal fibers and that primary atony of the longitudinal muscle results in the inability of the cardia to open. A break in the nervous pathway or a degeneration of the ganglia in Auerbach's plexus results in a loss of tone, permitting dilatation and inability of the cardia to open in rhythm with the swallowing reflex. Lendrum in 1937 sectioned the esophagus in more than 150 cadavers, many of which were dilated. He demonstrated a decided decrease in the ganglia of Auerbach's plexus and assumed that this was a definite cause of cardiospasm. In support of this neurotropic theory in well developed cases, there is usually an atonic condition of the esophagus, atrophy of the muscles and lack of peristalsis as seen in the fluoroscopic examination.

Etzel in 1938 stated that the destruction of the myenteric ganglia of Auerbach and Meissner may be due to severe vitamin B deficiency. Stinson in 1939 also advanced the vitamin B deficiency as the cause of cardiospasm, and reported recovery after treatment with vitamin B. It is felt by some observers that vitamin B treatment might help the early cases, but manifestly it could not straighten an "S" shaped, elongated, and greatly enlarged esophagus. Long standing cases of chronic cardiospasm do not generally show typical signs of vitamin B deficiency.

Normal Anatomy and Physiology

Anatomically the esophagus is a muscular tube about 25 cm. in length. There are two major areas of narrowing; the first at the beginning due to the cricopharyngeal muscle behind, and the cricoid cartilage in front; the second and the one which now interests us is at the hiatus of the diaphragm. The esophagus lies slightly to the left of the vertebral column and sometimes directly in front of it; but at the lower end passes decidedly to the left and then anteriorly to enter the stomach.

Histologically there are four coats to the esophagus; the mucosa, submucosa, muscularis and the outer fibrous layer which corresponds to the serous layer in the intestines. The muscularis consists of an outer longitudinal and an inner circular layer. In the upper

third of the esophagus these muscles are of the striated type. In the lower third they are unstriated, while in the middle they are mixed. The upper part of the esophagus is supplied by the glossopharyngeal and the superior laryngeal nerves while the lower part is supplied by the two vagus nerves along with the sympathetic. The vagus nerve terminates in the ganglion cells of Auerbach's plexus situated between the longitudinal and the circular fibers. Meissner's plexus which is essentially a part of the sympathetic system lies in the mucosa. The sympathetic fibers have their origin in the celiac ganglion.

The act of swallowing is a series of complex coordinated movements. It must be conceded that there is a swallowing center in the medulla near the origin of the vagus nerve and the respiratory center. There is always an inhibitory influence on the respiratory center following the first act of swallowing. The passage of food through the esophagus differs with its consistency. Liquids are shot into the upper third and then fall by their own weight the remainder of the way, while solids are propelled by the peristaltic waves after being pushed through the upper third by the pharyngeal muscles. The muscles producing these waves receive the impulses from the vagus nerves and not by local reflexes as the bolus progresses downward. The peristaltic wave is preceded in the lower segment by a wave of relaxation or inhibition. Some argue that the sphincter is opened by contraction of the longitudinal fibers, and therefore that when the esophagus is elongated or loosened from its point of fixation, the muscle is working at a mechanical disadvantage. After entering the stomach the food is prevented from returning into the esophagus by a reflex contraction of the circular fibers of the cardia probably due to stimulation of the plexus of Auerbach by the acid content of the gastric juices. The anatomic turn which the abdominal part of the esophagus makes before entering the stomach is also an important factor in preventing regurgitation.

Pathology

Grossly there is usually a greatly dilated esophagus. This occurs in the lower third but sometimes extends up to the cricoid cartilage. It is to be noted that the dilatation extends downward to the diaphragm and then abruptly stops. The subdiaphragmatic or abdominal portion of the esophagus is always quite narrow, although the hiatus of the diaphragm itself is not found to be unusually constricted. The muscular wall of the dilated esophagus is usually thin and atonic; however in some cases it is of normal thickness or even hypertrophied. In general the atonic esophagus shows no evidence of peristalsis in the fluoroscopic examination.

The greatly dilated esophagus lies like a sac over the right dome of the diaphragm. When filled and in the upright position, the right side of this sac is lower than the left. Toward the left the dilated esophagus narrows and forms an "S" shaped kink, then continues downward and to the right to enter the stomach. The weight of the contents of the esophagus, therefore, cannot act to a mechanical advantage. There occurs what is termed a "water-trap" effect—the greater the filling the more marked the kinking at the diaphragm level and the more the obstruction. The accompanying roentgenogram shows a typical example of this "water-trap" elongated esophagus. The continued retention of food in the lower esophagus causes a thickening of the mucosa, and also frequently ulceration.

Symptoms

Necessarily the symptoms will depend upon the type, duration and severity of the obstruction. Judd said,

> Broadly speaking there are two groups: one in which there is a sense of obstruction to the passage of food into the stomach without roentgen ray evidence of obstruction; such patients are likely to show psychoneurotic tendencies, and second in which there is a definite obstruction to the barium meal although the symptoms may be as mild as in the first group; psychoneurotic tendencies are practically never manifested.

Plummer made three classifications according to the symptoms manifested: first, cardiospasm without regurgitation of food; second, cardiospasm with immediate regurgitation of food; and third, cardiospasm with dilatation of the esophagus and regurgitation only at long and irregular intervals.

Dysphagia is the most persistent and most prominent symptom. There is difficulty in swallowing both solids and liquids. In mild cases of cardiospasm, particularly those occurring in neurotic individuals, immediate regurgitation occurs. In a well developed case after considerable food is eaten (and often at this stage the diet from experience is limited to liquids, and very soft foods) a sense of fulness occurs. Food may remain in the dilated esophagus for a variable length of time. A portion may be vomited immediately which will relieve the sense of fulness. The food often remains in the esophagus for forty-eight hours before regurgitation occurs and during that time undergoes fermentation causing discomfort and an offensive breath. Oftentimes at night during sleep the fluid content of the dilated esophagus will run out of the mouth without the patient's knowledge.

Pain may be present but frequently is absent. Pain in the early cases with active peristalsis is intense, while in the late cases with the large dilated esophagus there is a dull full feeling behind the

sternum. Loss in weight and general muscular weakness is progressive up to a certain point, after which there is very little change. The patients are not well developed and robust but are not starving to death. Their activities are cut down and thus energy is saved and loss of weight conserved. Constipation due to the restricted diet is present as a rule.

Diagnosis

Given a patient who complains of difficulty in swallowing, a fluoroscopic examination with barium is indicated. When there is seen an obstruction of the cardia with a smooth cone shaped end the diagnosis is almost surely cardiospasm. The advanced cases will produce a large sac-like esophagus with a tortuous "S" shaped outlet. Particles of food may make the outline irregular so that the esophagus should be washed out or better still an esophagoscope passed and the interior inspected. If the esophagus is of the spindle shape variety, the esophagoscope passes with little resistance. However, where there is a large sac with a tortuous "S" outlet, producing a "water-trap" effect, it may be difficult to find the outlet without a string as a guide. Hence it is better to have the patient swallow a string and pass the Plummer dilator over it. In order to make sure that the dilator passes the tortuous channel properly, it is suggested that this be done under the fluoroscope. If the 44 French sound passes with relatively little resistance the condition can be diagnosed cardiospasm without a doubt.

Differential Diagnosis

A common form of obstruction at the cardia is carcinoma; this may be present in the terminal esophagus or in the cardiac end of the stomach. The history of the gradually increasing difficulty in swallowing, the careful roentgenographic examination along with an esophagoscopy and biopsy if necessary should make the diagnosis certain.

Benign stricture such as those which occur from chemical burns are more common in the middle third of the esophagus; however if they occur at the cardia we usually find little or no dilatation above, and more active peristalsis. The evidence of chemical burns are seen with the esophagoscope, and only dilators in the smaller sizes will pass. A stricture secondary to a healed peptic ulcer of the cardia could be confusing. Foreign bodies lodged in the esophagus as the result of benign strictures will produce irregular edges as seen during the x-ray examination and are often mistaken for carcinoma. Esophagoscopy here will help materially. With a history of frequent regurgitation of undigested food, a diverticulum of the esophagus is most commonly suspected. Both diverticulum

of the esophagus and herniation of the diaphragm can be easily diagnosed by x-ray examination and esophagoscopy.

Treatment

The first recorded case treated successfully was by Thomas Willis in 1672 who used a whalebone bougie. The patient was instructed to use it frequently himself. The bougie in some form or other has been used more or less successfully ever since and is recognized as the first choice of treatment. As has been previously stated, antispasmodics and sedatives do no good for a real case of cardiospasm. They are known to be of benefit in those mild cases termed "spasm at the cardia," as seen in a nervous individual and in children. Here also the bougie is often called upon when medical treatment fails. Treatment by vitamin B as advocated by Stinson should certainly be tried in the early cases but it is logical to assume that vitamin B cannot correct the grossly elongated and misshapen esophagus of a long standing case of cardiospasm.

The Mayo Clinic has probably treated more cases of cardiospasm than any other one group. Much of the pioneer work there was done by Plummer. He was followed by Vinson and the work is now conducted by Moersch. In a recent communication from Moersch, he states,

> We are able to cure 75 per cent of our cases of cardiospasm by one course of dilatation. The other 25 per cent tend to have a recurrence of their difficulty. When this does take place, a second or third dilatation may be necessary which usually takes care of the condition. We have dilated more than 1,500 cases.

The most popular dilator is that of Plummer, which consists of a whalebone staff with a flexible metal tip which is threaded to a previously swallowed string. Graduated metal dilators are inserted between the flexible tip and the staff. Incidentally this bougie makes a very satisfactory dilator for benign strictures used with or without the gastrostomy opening. The Plummer dilator does not have the deteriorating qualities of the Jackson rubber bougie, and is graduated up to 44 French. Following the use of the 44 French, the 60 French sound is used. With the string drawn taut, there is little danger of perforation. However, it is our policy to pass the sounds on the first occasion under the fluoroscope to make sure the leading flexible portion takes the terminal twist into the stomach satisfactorily. Frequently in the mild or early cases the passage of the 44 or 60 French sound is sufficient. If not, the hydrostatic dilator as devised at the Mayo Clinic is similarly inserted and water pressure applied.

Mosher used a bougie with barium stripes upon the side to place it more accurately in the cardia. Tucker has devised a bougie to be placed accurately through the esophagoscope. The English have used a wide tube containing mercury. This tube follows the course of the esophagus by its own weight. It is admitted, however, in a widely dilated esophagus where the portion over the right dome of the diaphragm is below the entrance into the cardiac sphincter, this bag cannot find its way into the stomach. In fact in these "water-trap" "S" shaped types it becomes extremely difficult and often impossible to find the opening into the stomach even with the esophagoscope. Where dilatations have failed or where the gross lesion is such as to anticipate failure with the dilator, such as in the "water-trap" type of dilatation, operations are indicated.

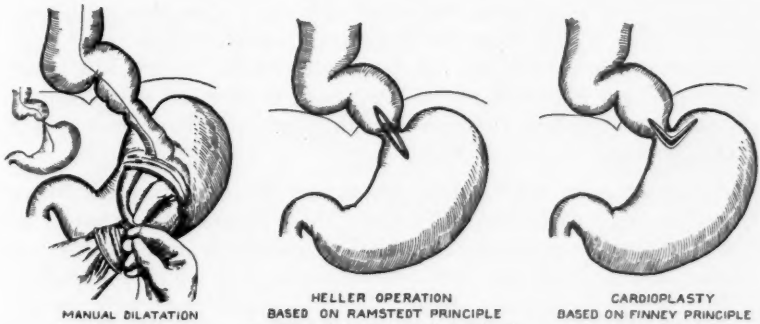
Surgical Treatment

Whereas the treatment of cardiospasm by dilatation with the use of bougies goes back as far as 1672, the credit for using modern surgical methods in the treatment of this condition goes to von Mikulicz who performed his first operation in 1900. His approach was through the open stomach. The constricted cardia was dilated manually through a gastrotomy opening. He reported six cases, five of which were successful while the sixth was a failure. From 1900 until 1938 there was a total of 40 such cases reported by nine different operators, all using this same method. In one of these 40 cases the operator used a metal forceps as a dilator and probably ruptured the esophagus. This case represents the only death in the series. Dilatation through a gastrotomy opening gave good results in 33 of the 40 cases. There were 3 cases reported as having fair results and 3 cases reported as having poor results.

In 1902 Freeman accidentally hit upon a new method for shortening the elongated esophagus which is found in all protracted cases of cardiospasm. According to his report of the operation he made an exploration through an incision in the left side of the neck and searched for a diverticulum along the upper part of the esophagus. He did not find the diverticulum, but the enlarged baggy esophagus was easily separated from the adjacent tissues and he pulled up a sizable loop of the esophagus into the incision thereby rendering taut the lower elongated portion of the tube. He found himself faced with the embarrassing problem of trying to decide what to do with this loop of esophagus protruding from the incision in the neck and solved the problem by invaginating the upper portion into the lower after the fashion of an intussusception. The intussusception was fixed with a few chromic sutures and the wound closed. The wound healed by primary intention and within a few days the

patient was able to swallow. He has followed the course of this patient for some twenty years and the results of this unusual operation have been highly satisfactory. So far as we are aware no other surgeon has ever attempted or reported such a procedure.

In 1907 Reisinger made the first recorded attempt to decrease the lumen of the dilated esophagus in cardiospasm by plication of the esophageal wall and later by removal of an elliptical segment from the wall. Shortly after that a similar operation was attempted in three cases by Willy Meyer. All of these operations were accomplished through a thoracic approach and presented serious mechanical difficulties. No one of the four operations resulted successfully. Though the condition was reported as having been considerably improved in one of the cases, the patient died a year later.



MANUAL DILATATION
MIKULICZ OPERATION

HELLER OPERATION
BASED ON RAMSTEDT PRINCIPLE
IN OPERATIONS FOR PYLORIC STENOSIS

CARDIOPLASTY
BASED ON FINNEY PRINCIPLE
IN PYLORIC OBSTRUCTION

In 1912 Rammstedt described the well known Rammstedt operation for pyloric stenosis and two years later, in 1914, Heller applied the same principle to the treatment of cardiospasm. In spite of the fact that there is considerable difference in the pathologic anatomy of the two conditions, we find that twenty-one cases out of the twenty-seven which have been operated upon by this method were reasonably successful. At the pylorus there is considerable hypertrophy of the muscular layer but in the esophagus the muscular layer is thin and it is very difficult properly to incise the muscular layer without injuring the mucosa. Furthermore, the mucosa of the esophagus is usually inflamed and edematous and there is always the risk of a postoperative rupture of the mucosa. The original operation of Heller called for two incisions at the cardiac orifice, one placed anteriorly and one posteriorly. Of the twenty-seven reported cases five were unsuccessful and there was one death. Such was the case operated by Scrimger. In this case the incision through the muscular layer was accidentally carried on down

through the mucosa and the operator made an effort to repair the opening in the mucosa, but the stitches sloughed out and the ensuing perforation caused the death of the patient.

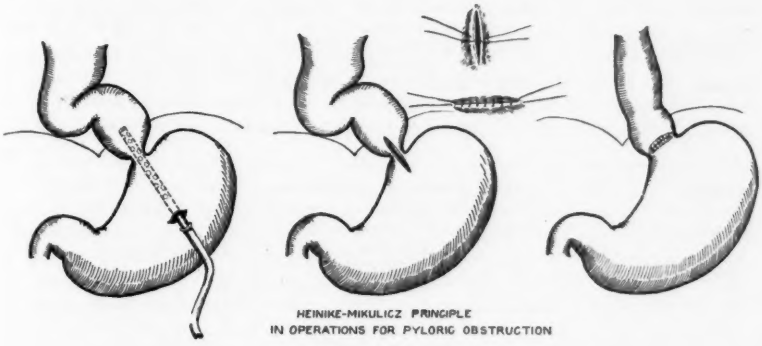
Scrimger reports three additional cases operated by a different method in 1931. For these later cases he attempted to shorten the elongated thoracic esophagus by bringing the lower end of it through the diaphragm into the abdomen thereby increasing the length of the abdominal esophagus. These three cases were operated without mortality, but the end results were only fair.

An entirely different approach to the treatment of cardiospasm may be credited to Adamson and Knight who conceived the idea that the condition might be helped by interrupting the sympathetic nerve supply to the lower end of the esophagus. The operation employed called for the resection of a portion of the left gastric artery and its esophageal branches. In 1935 they reported four cases in all of which some degree of symptomatic relief was achieved. Subsequently five other cases have been reported by other operators, but only one of the five cases is credited with being a success. On the whole the results of this operation have been rather disappointing.

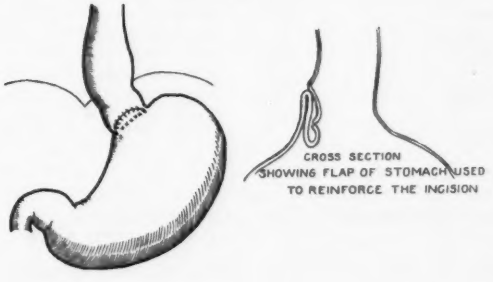
A very unusual case of cardiospasm was reported from the Mayo Clinic in 1934 as having been successfully treated by cervico-thoracic sympathetic ganglionectomy. The unusual feature of this particular case was the extreme and constant pain which the patient suffered. By careful investigation it was found that the injection of procaine into the sympathetic ganglion at the level of the seventh cervical and first dorsal vertebrae resulted not only in the production of a Horner's syndrome but also in the complete relief of pain and discomfort on the part of the patient. After the injection the patient was able to swallow all types of food without difficulty. So great was her distress that it was decided to attempt to give her permanent relief by the resection of the cervicodorsal ganglia. The same satisfactory result was obtained by the resection as was obtained temporarily by the injection of procaine into the ganglia. There have been no other cases of a similar nature described.

So far we have described several different surgical approaches to the treatment of cardiospasm, but we have reserved until last the method of cardioplasty which appears to us to be the most logical and straightforward surgical method. In 1887 Mikulicz elaborated on a principle suggested by Heineke. This is now known as the Heineke-Mikulicz procedure in the treatment of pyloric obstruction. In 1902 Finney described his equally well known method for accomplishing the same result. The method of these two operators is well known to all surgeons. In 1910 Wendel applied the prin-

ciple of the Heineke-Mikulicz operation to the problem of cardiospasm, and in 1913 Lambert applied the Finney method to the same problem. In all there have been four cases reported of the Heineke-Mikulicz procedure as applied to cardiospasm and all of them have been successful. There have been seven cases reported which were done by the Finney technic and they were equally successful. To these eleven successful cases we are happy to be able to add one of our own which was done according to the Heineke-Mikulicz principle.



HEINIKE-MIKULICZ PRINCIPLE
IN OPERATIONS FOR PYLORIC OBSTRUCTION



CROSS SECTION
SHOWING FLAP OF STOMACH USED
TO REINFORCE THE INCISION

Author	Date	No. Operations Reported	Result: Good	Fair	Poor	Deaths
Mikulicz	1900	6 manual dilatation	5	0	1	0
Pamperl (collected)	1919	14 manual dilatation	12	2	0	0
Thereding (collected added)	1921	3 manual dilatation	3	0	0	0
Schmielensky	1921	1 (used forceps)	0	0	0	1
Morley	1927	1 manual dilatation	0	0	1	0
Judd and Vinson	1929	2 manual dilatation	2	0	0	0
Butler	1931	1 manual dilatation	1	0	0	0
Nagel	1936	1 manual dilatation	0	0	1	0
Bird	1938	1 manual dilatation	0	1	0	0
		30	23	3	3	1

Author	Date	No.	Operations Reported	Result: Good	Fair	Poor	Deaths
Heller	1914	16	Heller oper.	12	0	4	0
Zaaijer	1923	8	Heller oper.	8	0	0	0
Scrimger	1931	2	Heller oper.	8	0	0	0
Turner	1939	1	Heller oper.	0	0	1	0
		27		21	0	5	1
Lambert	1913	1	cardioplasty (Finney principle)	1	0	0	0
Watt	1923	1	cardioplasty (Finney principle)	1	0	0	0
Kaller	1928	1	cardioplasty (Finney principle)	1	0	0	0
Churchill	1935	2	cardioplasty (Finney principle)	2	0	0	0
Womar	1938	2	cardioplasty (Finney principle)	2	0	0	0
		7		7			
Wendel	1910	1	cardioplasty (Heineke-Mikulicz principle)	1	0	0	0
Meyer	1913	1	cardioplasty (Heineke-Mikulicz principle)	1	0	0	0
Turner	1939	2	cardioplasty (Heineke-Mikulicz principle)	2	0	0	0
		4		4			
Meyer	1913	3	plication	0	0	3	0
Sauerbruch		3	esophago gastrostomy	2	0	0	1
Freeman	1902	1	shortening esoph. neck intussusception	1	0	0	0
Scrimger	1931	3	shortening thoracic esoph. by lengthening abd. portion	0	3	0	0
		10		3	3	3	1
Adamson and Knight	1935	4	resection portion left gastric artery & sympathetics	4	0	0	0
Souttar	1935	2	resection portion left gastric artery & sympathetics	0	2	0	0
Stubbe	1935	1	resection portion left gastric artery & sympathetics	0	0	1	0
Eliason and Erb	1937	2	resection portion left gastric artery & sympathetics	1	0	1	0
		9		5	2	2	0
Craig, Moersch and Vinson	1934	1	cervico-thoracic sympathetic ganglionectomy	1	0	0	0
Total		88		64	8	13	3

Case Report

Mrs. C., 22 years of age, was admitted to the Ohio Valley General Hospital Aug. 3, 1939, complaining of palpitation of the heart and regurgitation of food. The family history was unimportant. The past history, except for the present illness, also was unimportant.

At the age of 10 years the patient began to notice that fluids, after being swallowed, would be regurgitated. This condition gradually became worse until she was unable to take solid food, and often the food which she did eat would be regurgitated 24 to 48 hours afterward. During the period of twelve years there had been times when the condition was much worse and it was often necessary for her to sleep with a large Turkish towel by the side of her mouth because during the night as much as a cupful or more of fluid would run out of her mouth on the pillow. In recent years she had noticed some epigastric pain immediately after eating and there was associated a sense of pressure beneath the sternum in the region of the xiphoid process. One of the most distressing symptoms was the palpitation of her heart after eating or drinking and the consciousness of gurgling noises in her throat while lying quietly.

Physical examination was essentially negative except for a moderate degree of malnutrition. Roentgenograms of the esophagus revealed an enormous dilatation with an overhanging portion in the upper third which, when full of liquid barium, pulsated because of its proximity to the arch of the aorta. The lower third of the esophagus was "S" shaped and ended in a pencil-like constriction at the cardiac orifice. Operation was advised and done after several days of preoperative preparation which consisted of emptying the esophagus and getting it as clean as possible by repeated lavage.

Operation

An incision was made from the xiphoid to the umbilicus. It was found that the stomach was considerably contracted, being very much smaller than one sees in a patient of this habitus. The left lobe of the liver was retracted laterally and the exposure of the cardiac orifice and abdominal portion of the esophagus was accomplished without much difficulty. The abdominal portion of the esophagus ended in a pencil-like constriction at its junction with the stomach. This portion of the esophagus was approximately 4 cm. in length. An opening was made in the anterior wall of the stomach and an aspirator inserted through the cardiac orifice into the lower dilated esophagus. In spite of all the preoperative preparation approximately four ounces of fluid was aspirated from the lower esophagus. Gentle traction was made on the stomach and the esophagus, and by careful blunt and sharp dissection the esophagus was pulled into the abdominal cavity until the abdominal esophagus was about 9 cm. in length. An incision was then made in the narrowest portion of the cardiac orifice over the aspirator down through the mucosa, the incision being 6 cm. in length, half on the esophagus side and half on the stomach side. The opening in the stomach and esophagus was then closed in the transverse, using two rows of carefully placed interrupted fine silk sutures. A fold of the cardiac end of the stomach was then sutured over the suture line to the esophagus. These sutures incorporated the seromuscular layer of the esophagus and stomach. The aspirator was then removed and the opening in the stomach closed by interrupted fine chromic catgut sutures. The abdomen was closed in layers in the usual manner.

The patient made an uneventful recovery. The usual postoperative care that modern surgery demands was carried out. She was given nothing by mouth during the first three days, receiving fluids by the intravenous method, frequent carbon dioxide inhalations and sedation. On the fourth postoperative day water was started in small amounts gradually increasing the amount until on the eighth day she was started upon a soft diet. This was well tolerated. There was a slight wound infection which was noticed on the eleventh day. This healed rapidly after evacuation of the pus. The patient was discharged on the seventeenth day following the operation, and as she put it, looking forward to a "steak dinner." Eight months after operation the patient has gained 25 pounds, feels fine, has no symptoms referable to the esophagus, and is eating everything which is in the normal diet of a well individual.

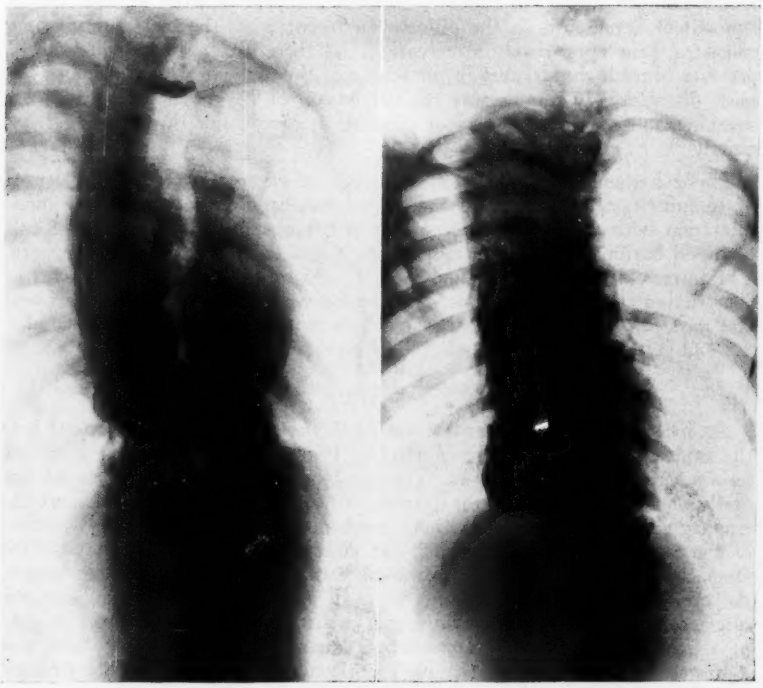


Fig. 1. Mrs. C. Esophagus filled with a thin barium mixture. Upper third of esophagus resting on arch of aorta. Pencil point narrowing at cardia. No barium in stomach.

In conclusion we would like to tell you what we consider the best method of treating these intractable cases of cardiospasm. We know that 75 per cent of the cases of cardiospasm will respond favorably to one or more dilatations by bougies but there remains the other 25 per cent which do not respond and the patients are doomed to a life of suffering unless they have successful surgical intervention. There is a very general impression that we should not

resort to surgery in these cases because it is highly dangerous. On the other hand, our review of the published cases of the surgical treatment of cardiospasm leads us to an entirely different conclusion. Out of 92 published cases there have been only three surgical deaths and that mortality rate compares very favorably indeed with the rate for almost any other major surgical procedure.

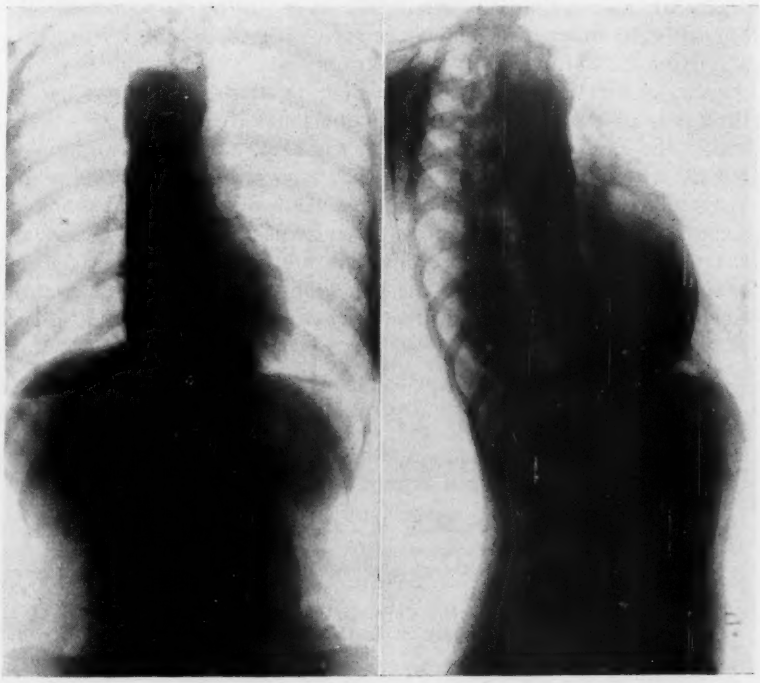


Fig. 2. Mrs. C. eight months later after cardioplasty. Esophagus still enlarged but shortened, filled with barium paste. Open cardia. Active peristalsis. Normal size stomach.

Our choice of operative methods is the cardioplasty described above. But in carrying out this operation it is essential to bear in mind the importance of the technical detail which has been so carefully described in the monograph on the experimental surgery of the esophagus published by Wayne H. Saint. One of the important points is the very careful preparation of the esophagus prior to operation and we have personally added thereto the use of mechanical suction to cleanse the esophagus during the course of the operation. The use of the suction tube will cut down gross contamination immeasurably. The careful use of fine silk interrupted sutures is important. Not only must they be placed carefully but they must

be tied so as to conserve the blood supply to the line of anastomosis. These friable tissues must be handled very gently and in order to obtain a good result there must be absolutely no tension along the suture line. It is well to reinforce the line of suture by an omental graft or by covering it with a fold of stomach. The latter is preferable in our opinion. As a preliminary to the cardioplasty we believe that it is absolutely necessary to the success of the operation to shorten the thoracic part of the esophagus by drawing a portion of it through the diaphragm into the abdominal cavity thereby elongating the abdominal portion of the esophagus before the cardioplasty is begun. It is obvious that this maneuver will increase the ease of operation and at the same time by straightening out the esophagus it allows food that is swallowed to travel along a straight course to the stomach. We are firmly convinced that reasonably successful results may be anticipated in these desperate cases, if this method of procedure is adopted, and if in addition thereto the patient is given the benefit of all the ordinary precautions in the way of pre- and post-operative care which modern surgery dictates.

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FRACTURES OF THE NECK OF THE FEMUR

Treated by Internal Fixation with Adjustable Nails

End Result Studies

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and

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NO longer can intracapsular fractures of the hip joint be spoken of as the "unsolved fracture," as described by Kellog Speed. No doubt there will be improvements in the future, but already in our opinion and in our experience this fracture problem has been solved in a rather satisfactory way. Only a few years ago we dreaded to see these patients come in for treatment. The prognosis was poor and the morbidity and the mortality were high. Now these fractures are welcomed, we are glad to see them, and we know that an optimistic prognosis can be given.

In reviewing the literature on this subject, we found a statement by an early French surgeon to the effect that he had never seen union in a single case of fractures through the neck of the femur and he did not believe that it could occur. Of course, that was many years ago and before the time of the abduction cast. Now, with operation, union can confidently be expected in 90 per cent or more of these cases and we have prepared a special group of statistics in support of this statement. The difference between zero and 90 per cent is quite a contrast. During the past five years, we have operated on 148 patients—an average of one case approximately every ten days. There were 88 intracapsular and 60 intertrochanteric fractures. All of the intertrochanteric fractures united as would be expected. The intracapsular fractures are the particular problems and these have been chosen for study. Fifty of these cases have been seen consecutively and have been followed for a period of from one to five years after operation until repeated clinical and x-ray examinations have shown positive end results. In this group, solid bony union has occurred in 45 cases, or 90 per cent. There was questionable union in one case, or 2 per cent, and there was definite non-union in four cases, or 8 per cent. These figures include the first cases that were operated on five years ago. The technic has been improved with time and experience and the cases we are doing now are showing a higher percentage of good results.

Space will not be taken to outline the advantages of open operation with internal fixation in the treatment of hip fractures. Pa-

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Read before the Postgraduate Surgical Assembly (the eleventh annual meeting) of The Southeastern Surgical Congress, Birmingham, March 11, 12, 13, 1940.

tients are made more comfortable, they are gotten up and out of the hospital with a minimal expense of time and money, and in every way the advantages of operation are greater. Operation now seems to be generally accepted as the treatment of choice.

All intracapsular and most of the intertrochanteric fractures can be treated by operation with multiple nailing. The operation can be performed with either local, general, or spinal anesthesia and rarely is there any shock to the procedure. The shock of not operating is more than the shock of operation, and age or general physical condition is usually no deterring factor. The operation, when done properly, does not require over forty minutes and is not a difficult surgical procedure. It is, however, very difficult to one who does not thoroughly understand all of the fundamental mechanical factors involved and who is not thoroughly equipped and experienced in bone surgery. If the operation is considered lightly and is attempted without training and minute knowledge of all details, the results are going to be disastrous. The line of the fracture, time since the accident, condition and age of the patient, etc., all have an influence on the operation and postoperative care. Frequently the care during convalescence is as important as the operation in bringing about a successful end result. These details have previously been enumerated and published. Time will be taken here only to briefly outline the technic of operation and the reasons for its preference.

The operation is performed through a lateral incision exposing the subtrochanteric region of the femur. The patient lies in a tunnel through which x-ray films can be placed from the opposite side of the table. The entire extremity is draped for operation. Reduction is performed after the field is prepared; the head of a portable x-ray unit is centered over the injured hip and is covered with sterile drapes. The position of the patient is not changed again during operation. Lateral x-rays are made by flexing the thigh at a right angle. We should like to emphasize a position in which beautiful, clear lateral x-rays can be made. The thigh is flexed to less than a right angle and the leg is abducted and externally rotated. The heel on the injured side is carried to a spot over the upper third of the opposite thigh. In this position the trochanters are thrown out of the line of direction of the rays and a perfect exposure of the femoral neck is made. X-ray films are developed in a small dark room adjoining the operating room. Warm, concentrated solutions are used so that the films may be viewed without loss of time.

Early in the series three adjustable stainless steel nails were used; one nail was placed in the upper and two in the lower portion of the neck. Following consultation with the engineering department at

the University of South Carolina where experimental studies were made, we found that four properly placed nails give maximum support with minimal displacement of bony substance. The nails are spear pointed and are inserted by hand, holding them in a chuck handle. The points are not too sharp and as the nail is rotated backward and forth and pushed upward through the neck into the head, its position can be determined largely by the sense of touch. After the first nail is inserted a small direction finder is slipped over its end and its position is checked by anteroposterior

Fig. 2-A. Anteroposterior view of hip showing four stainless steel adjustable nails in place. Note that the nails are placed at widely separated points in a parallelogram manner thus gaining maximum mechanical fixation.

and lateral x-ray views. If the position is good, a small projecting rod is slipped over its end to make a guide for inserting the remaining nails. Two nails are inserted in the upper and two in the lower portion of the neck, lying as nearly as possible in the lines of stress and strain that have been laid down by Nature. The central cancellous portion of the neck is its softest and weakest portion; it is the neutral axis and bears the least possible strain. For that reason, the nails should not go up through the center of the neck but the points should be distributed as widely as possible in the head of the bone. The tension, compression, shearing and rotary stresses are taken care of when this is properly done. Check-up x-rays are

made to determine that the nails are correctly placed, extra drill holes are made into the head for increased blood supply, the fragments are lightly impacted, a small piece of stainless steel wire is wrapped behind the nuts and the wound is closed in the customary manner.

As a rule the fixation is solid. No external support is used and the patient is allowed to be up in a wheel chair and on crutches, without weight bearing, after several days. Early active use of the

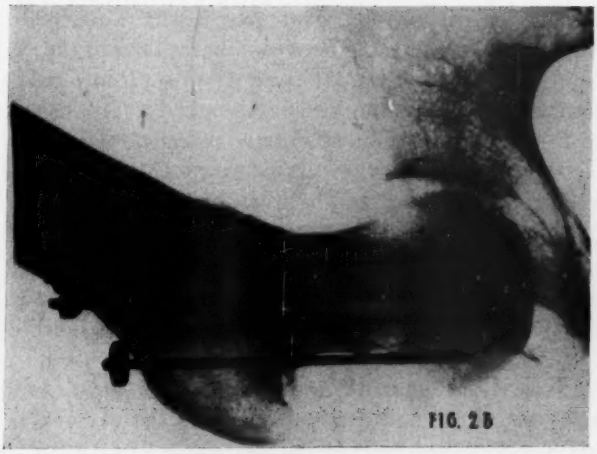

Fig. 2-B. Lateral view of hip showing position of nails. The four nails take all possible stress and strain exerted on the hip.

limb is encouraged but weight bearing is forbidden for six months. Check-up x-rays are made at intervals of each two months and oftener if indicated.

By experimental work and clinical experience we are convinced that multiple nailing properly performed gives the most rigid fixation yet devised for fractures of the femoral neck. No patient should be allowed to leave the operating room without perfect reduction of the fragments and perfect internal fixation if this is possible. If the fracture can be reduced early and perfectly immobilized there will be very little fractional irritation with decalcification and very little absorption of the neck. In the review of our cases, we have not encountered a single case where union failed to occur when the fragments were perfectly reduced and perfectly immobilized. Each one of the cases failing to unite or demonstrating considerable absorption of the neck was found to have been poorly immobilized from a mechanical standpoint. In other words, by reviewing the original x-ray, we could prognosticate the end

result by the position of the fragments and the mechanical fixation in each particular instance. If all mechanical and physiologic factors are carefully considered treatment of fractures of the neck of the femur should be a satisfactory procedure and union should result.

End Result Study

There was a total of 148 cases operated. Sixty of these cases were intertrochanteric, the remaining cases were intracapsular. Of these 88 cases of intracapsular fractures, 50 have reached the end result stage, the time elapsing between operation and the end result being from one to five years. It is interesting to note that in both the intracapsular and in the intertrochanteric cases, the fractures occurred in the females almost exactly twice as often as they occurred in the males. The ages varied from 18 to 94 years but by far the largest group occurred between 60 and 80 years. The preoperative condition was in most cases poor, the patients being old, with cardiac and other chronic conditions.

In the intracapsular cases which are studied for end results, spinal anesthetics were used in most of the cases, especially those done in the latter part of the series. There were 48 spinal anesthetics, 28 local, 11 general, and one twilight sleep. In most of these cases the three nail method was used before the new procedure of four nails was developed. During the past two years, the four nail procedure has been used exclusively. In one case five nails were used. In only one case was there surgical shock following operation and in this case, shock can be accounted for because of numerous other injuries patient had received in the accident in which the hip was broken.

Most of the cases were allowed in a wheel chair within the first three to four days following operation and were allowed to be up on crutches within the first week. Weight bearing was allowed in the largest group between five and six months. Many were allowed to bear weight earlier than that because of our enthusiasm over the method early in our series. There was solid bony union in 45 of the 50 cases studied for end results, or 90 per cent. In these 45 cases of solid bony union, internal fixation slipped in one case, there was absorption of the neck in 12 cases, and necrosis of the head in three cases. Solid bony union occurred in spite of the necrosis of the head because of rigid immobilization of the fragments. There was non-union in four cases, or 8 per cent. In these four cases, fixation slipped in two cases, absorption of the neck in each case, and

necrosis of the head in two cases. There was questionable union in one case.

Immobilization is unquestionably the secret of solid bony union in cases of intracapsular fractures of the neck of the femur.

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SHORT PAPERS

Near a small Pennsylvania town in November, 1863, a two hour oration was delivered to a most enthusiastic audience. At its end a tall lean man spoke less than ten minutes; he made little impression on his hearers. The florid long-winded speech, delivered that day, has since served but to gather dust and its author is all but forgotten. The second speaker's words are carved in marble on the walls of a Doric temple in Washington and every school boy knows the Gettysburg Address.

The Gettysburg Address of course is in a class by itself. However, if one looks into medical literature he can find little masterpieces that will perhaps last as long, gems that still sparkle after a century or more. William Heberden's original two page account of angina pectoris, for example, describes the syndrome in language that is simple enough for a child to understand, but that has the roll and majesty of Dante with the scientific accuracy of the multiplication table.

What we are working up to is a plea for short papers. The exhaustive (sometimes exhausting) treatise has its place. It is a fine thing for a doctor once in his career, especially when patients are not demanding a great deal of his time, to review everything that has been written on a particular subject; running down every lead—for some authors have contributed to obscure, perhaps extinct, journals or hidden the value of their work under titles that give no idea of its content—has all the fascination of playing the lead in a detective story. Such an Arbeit certainly benefits the man who does it. The review of a large series of cases is also valuable; we have

evidenced our appreciation of such careful studies in the first forty pages of this issue. Such theses serve to advance knowledge. Of course a statistical study has its pitfalls. If one has 200 cases but only succeeds in following up 90, he can't tell if 110 patients died of their disease or made a complete recovery, and so he is not justified in drawing any conclusions from the 90 patients followed. The period of study must be adequate too. Charity patients in particular, after a few weeks in a comfortable hospital bed, with good food, unaccustomed attentions and the complete freedom from responsibilities, usually leave the hospital feeling well. The vogue of bilateral oophorectomy was largely because of a short follow-up: women who survived the operation and enjoyed the sheltered environment of the hospital, were on dismissal thought to be cured of what ailed them.

Good case reports, as we have pointed out before in these columns, serve as the building stones of progress in clinical medicine. A well written account of a carefully studied case, while it may establish no new principle, may call attention to a point important in differential diagnosis, or bring out a detail of treatment that may prove stimulating.

While a young surgeon may not have a wealth of experience, may not have a huge series of cases to report, the very fact that he is filled with youthful enthusiasm for his profession may enable him to grasp unusual aspects.

Finally, THE SOUTHERN SURGEON, like every other medical journal, wants good short snappy papers. The Surgeon, in particular needs short articles because with the number of its pages strictly limited for the current year, it is difficult to come out even with the preponderance of its material tending to be lengthy.

THE ASSOCIATE EDITOR

Dr. Walter G. Stuck, of San Antonio, has been made Associate Editor of THE SOUTHERN SURGEON. Dr. Stuck, as Secretary of the Texas Surgical Society, has as his immediate province the papers read before that society; he will also have charge of other papers originating in Texas and of those dealing with orthopedic surgery.

EVERETT FOSTER JONES, A. B., M. D., F. A. C. S.

1885-1940

Everett Jones, President of the Texas Surgical Society, died in the Knickerbocker Hotel, Hollywood, California, Monday afternoon, July 15, 1940. Heart disease had forced his retirement from active practice over a year ago, but he retained his interest in medical affairs and one of his last official acts was to preside over the twenty-fifth anniversary meeting of the Texas Surgical Society in April 1940.

He was born in Sherman, Texas, in 1885 where he received his preliminary education. From 1900 to 1904 he attended Texas Christian University and was graduated with the Bachelor of Arts degree. While at T. C. U. Everett Jones played shortstop on the baseball team and for the remainder of his life was a most loyal fan and supporter of the ball team in Wichita Falls.

He attended the medical school of the University of Texas in Galveston from 1904 to 1908 after which he interned in the John Sealey Hospital in Galveston. He then moved to Wichita Falls, where he practiced for the remainder of his life.

Soon after America entered World War I, Dr. Jones organized a medical detachment which he commanded as major in the Seventh Texas National Guard regiment. They entered the federal service as the 142nd Infantry, 36th Division. Dr. Jones served in a field hospital at Camp Bowie and later in a base hospital at Le Mans, France.

While in France, Dr. Jones and his college classmate, Dr. Q. B. Lee, met and made plans to open a hospital in Wichita Falls. When they returned home in the spring of 1919, the Burburnett oil boom was at its peak and they were successful from the start. The present Wichita Falls Clinic-Hospital which was opened in 1926 represented the greatest of Dr. Jones' achievements. To the end he considered it his most worthwhile effort and devoted much of his time in the past year to the executive functions of the hospital.

Dr. Jones served as President of the Wichita Falls Chamber of Commerce, Wichita County Medical Society, the District Medical Society, and the Texas Surgical Society. He was a member of the Founder's Group of the American Board of Surgery.

The medical profession of Texas has lost one of its most able men, and the city of Wichita Falls will miss a distinctive public spirited personality in the passing of Everett Jones.

—WALTER G. STUCK

Everett Foster Jones, M. D.

UNIV. OF MICH.

BOOK REVIEWS

The Editors of THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

PRINCIPLES OF SURGICAL CARE, SHOCK AND OTHER PROBLEMS. By ALFRED BLALOCK, M. D., Professor of Surgery, Vanderbilt University School of Medicine, Nashville. Price, $4.50. St. Louis: The C. V. Mosby Company, 1940.

This monograph is an amplification of the Beaumont lectures for 1940. It is fitting that the nineteenth series of Beaumont lectures should be given by Alfred Blalock for he, like William Beaumont, is not only a clinical surgeon but also a tireless investigator of the physiologic principles underlying surgical practice. Dr. Blalock's numerous contributions to the field of peripheral circulatory failure have done much to dispel the mists that have clouded the mechanism of this all too frequent phenomenon.

After reading Dr. Blalock's monograph one is convinced that operation constitutes but a part of the correct treatment of the surgical patient. An equally important part, and one which until recently was seriously neglected, is the preoperative and postoperative treatment of surgical patients, the subject of this book.

Following a brief introduction, various anesthetics are discussed from the standpoint of explosive qualities, controllability of administration, elimination, toxicity, the anoxia produced, and their applicability for use in various operative procedures. The importance of using at least 15 per cent oxygen with any anesthetic agent is stressed.

In considering surgical technic and the treatment of wounds, asepsis, hemostasis, obliteration of dead space, and gentleness in the handling of tissue are emphasized. Tissues should be approximated by sutures, not crushed. Strong antiseptics should be avoided. Dr. Mason has said "the tremendous amount of damage and harm to living tissue caused by antiseptics is a credit to the drug salesman and a discredit to us." Infection and disruptions of wounds are mentioned and advice given as to their prevention and treatment.

There has long been a fear, often unfounded, on the part of surgeons to operate on patients with real or supposed heart disease. Dr. Blalock's discussion of surgery in the cardiac patient is a great help in separating those patients in whom operation is contraindicated, except as a great emergency, from those in whom operation will be attended by onlv slight increase in operative risk. Not so many years ago some surgeons were wont to give so called tonic doses of digitalis to patients with no definite evidence of heart disease. It has been shown that digitalis decreases the output of a normal heart. Indications for its use in surgical patients are clearly stated.

About one third of Dr. Blalock's monograph is devoted to a detailed consideration of shock, better called peripheral circulatory failure. His vivid description of this state is followed by points to be used in differentiating it from acute cardiac failure. Various theories of the mechanism for the production of shock are discussed and evidence is presented both for and against each theory. The different types of shock (hematogenic, neurogenic, and vasogenic) are defined and the prevention and treatment outlined. The use of alkali, hypertonic saline solution, oxygen, and adrenal cortex is discussed.

There is an excellent chapter on the fluid requirements of surgical patients

including the methods of administration and the types of solutions employed. Disturbances in the acid-base equilibrium, their prevention and treatment are adequately considered.

In speaking of the treatment of burns Dr. Blalock stresses the importance of administration of blood plasma or whole blood and avoiding the use of excessive amounts of non-colloidal solutions which would further increase an already existing hypoproteinemia.

Special problems arise in the surgical care of children, the aged, the obese, the hypertensive and the nephritic patient. These problems are explained. Vitamin deficiencies, including vitamin K deficiency are discussed. Additional chapters deal with postoperative pulmonary, urinary, and other complications. The idea is expressed that postoperative cystitis is probably more often due to the lack of catheterization allowing residual urine to collect in the bladder, than to the too frequent use of a catheter.

A chapter dealing with postoperative abdominal complications discusses the treatment of abdominal distention by the use of drugs, heat, Wangensteen suction, concentrated oxygen, and the Miller-Abbott tube. It is interesting that intestinal intubation by the Miller-Abbott tube is finding an ever widening field of usefulness in the treatment of obstructing lesions of the bowel in which there is no diminution of the blood supply to the bowel wall. It is quite possible that this method of treatment will entirely supplant enterostomy in the treatment of distention of the bowel.

This book is only 325 pages long, including the index. Hence it is not one of the back breaking tomes so often encountered in medical literature. The paper is of good quality and the type large and clear. Though the book is short it is packed with first class authoritative information essential to the intelligent management of surgical patients. For this reason the reviewer considers it a "must" for the library of every surgeon. It will also be of great help to the internist working in conjunction with the surgeon in preparing his patient for operation.

GEORGE F. ARCHER, M. D.

FRANK HOWARD LAHEY BIRTHDAY VOLUME. June 1, 1940. 456 pages. Illustrated. Springfield and Baltimore: Charles C Thomas, Publisher, 1940.

For many years in Europe former students and other friends and admirers of famous doctors have often delighted to honor them during their lifetime with the publication of a group of papers in book form on the occasion of a birthday or some other anniversary. It is nice to see this custom being adopted in America.

This volume to Frank Howard Lahey, President of the American Medical Association on his sixtieth birthday will prove a pleasure to those who love him. Among the contributors to this nosegay are Irvin Abell, Arthur W. Allen, Donald C. Balfour, George Crile, Grover C. Penberthy, Fred W. Rankin, Waltman Walters and Walter C. Alvarez, all of whom have contributed to this journal in days past. Considerable emphasis is placed on surgery of the thyroid and of the stomach and of the large bowel, fields in which Dr. Lahey has done so much work, but all of the papers are well worth reading.

The publisher has provided a charming format.